NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

USING MARGINAL ANALYSIS
TO LOAD COMBAT LOGISTICS
FORCE (CLF) SHIPS

by

K. Craig Wilson

December 1994

Principal Advisor: P. J. Fields

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REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 1994	Master's Thesis

4. TITLE AND SUBTITLE : USING MARGINAL ANALYSIS TO LOAD COMBAT LOGISTICS FORCE (CLF) SHIPS	5. FUNDING NUMBERS
6. AUTHOR Kenneth C. Wilson	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey CA 93943-5000	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION/AVAILABILITY STATEMENT	12b. DISTRIBUTION CODE
Approved for public release; distribution is unlimited.	

13. ABSTRACT *(maximum 200 words)*

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14. SUBJECT TERMS Combat Logistics Force (CLF) Inventory Model			15. NUMBER OF PAGES 77 16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18 298-102

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USING MARGINAL ANALYSIS
TO LOAD COMBAT LOGISTICS
FORCE (CLF) SHIPS

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of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
December 1994

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ABSTRACT

This thesis provides an algorithm based on marginal analysis to help CLF Supply Officers load ships with Provisions (food), High Usage Load List (HULL), and ship store stock. The algorithm is incorporated into an EXCEL spreadsheet and produces a prioritized list of items in their optimum stocking sequence. The algorithm is compared to both the Atlantic and Pacific Fleet current loading methods using a food item example and shows a 60-70% increase in expected supply effectiveness. Furthermore, the algorithm is generic and can be applied to any inventory problem where a demand distribution is known and space is the limiting factor in determining stocking levels.

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LIST OF ACRONYMS AND ABBREVIATIONS

AMD	Average Monthly Demand
AO	Fleet Oiler
AOE	Multi-commodity CLF ship
AOR	Area of Responsibility or Multi-commodity CLF ship
CARGO	Consolidated Afloat Requisitioning Guide Overseas
CDF	Cumulative Distribution Function
CLF	Combat Logistics Force
COMLOGWESTPAC	Commander Logistics Group, Western Pacific
COMNAVSURFLANT	Commander Naval Surface Forces, U. S. Atlantic Fleet
CONUS	Continental United States
FILL	Fleet Issue Load List
FMSO	Fleet Material Support Office
HULL	High Usage Load List
LSD	Amphibious Dock Landing ship
NEXCOM	Navy Exchange Command
NAVFSSO	Navy Food Service Support Office
pdf	Probability Distribution Function
SPCC	Ships Parts Control Center
T-AFS	Military Sealift Command Fast Combat Stores Ship
WESTPAC	Western Pacific

I. INTRODUCTION

In the private sector and in shore based military situations, inventory models are typically designed to minimize total inventory cost by balancing the cost of holding inventory against the cost of not having inventory on hand when it is needed. The holding cost is normally a combination of capital, insurance, obsolescence and deterioration costs. The cost of not having an item is measured in lost sales, reduced goodwill and lost production (private sector) or operational time (military).

Inventory decisions for ships and other mobile units follow the same basic principle of considering the trade-off between holding and stock-out costs. However, balancing these costs may not always be useful because the stock-out costs can far outweigh the holding costs. As a result, the optimal quantities determined by the usual method may exceed the amount of on-board space available. This is particularly true when determining inventory quantities to be loaded on Combat Logistics Force (CLF) ships. The CLF ship acts as the principle source of supply for deployed combat ships and units, so the CLF Supply Officer's objective is not cost minimuzation, but rather customer service maximization. The relevant constraint to maximizing customer service is the total space available for holding inventory.

The material carried on CLF ships is classified into five commodities: Fleet Issue Load List (FILL) material; provisions (food); ship's store merchandise; High Usage Load List (HULL) material; and petroleum products (AO Deckload). The itemized lists of this material is published in the Consolidated Afloat Requisitioning Guide Overseas (CARGO) and is maintained by the Ship's Parts Control Center (SPCC), the Fleet Material Support Office (FMSO), the Navy Food Service Support Office (NAVFSSO) and the Navy Exchange Command (NEXCOM).

The stocking quantities and reorder policies for FILL inventories are determined by SPCC by operational analysts who strive to determine optimal inventory levels.

However, the other commodities are controlled at the operational staff and shipboard level by personnel who frequently lack the expertise to make appropriate stocking decisions.

In the recent past, Pacific CLF ships have been deployed almost exclusively to the Persian Gulf and Atlantic CLF ships have had a regular deployment schedule to the Mediterranean Sea. This resulted in the development of stable logistics pipelines and a regular re-supply schedule. If the CLF deployed with a poor mix of material, the initial load could be supplemented by re-supply. The nature of current operations are less predictable. They often do not last long enough to set up re-supply pipelines. These dynamic operational situations will likely continue in the future.

During the cold war, it was U. S. Navy policy to keep inventory levels in excess of lead time demand on CLF ships because, if a war were to breakout with the Soviet Union, our re-supply pipelines would be disrupted. The CLF would be forced to operate without re-supply. Now the same idea is also sound, but for a different reason. Today's political environment produces limited conflicts which can happen anywhere in the world and typically last a year or less. These short operations are often completed before a re-supply pipeline can be established. In this logistics environment, the inventory problem is to find the right mix of products to carry, in order to satisfy the maximum number of customer demands constrained by the CLF ship's storage capacity.

Procedures for determining the amount of non-FILL material to load for a deployment are currently not standardized throughout the Navy. Guidance is frequently passed informally from ship to ship or from staff member to staff member resulting in inconsistent and often poor fleet customer service due to stock outs. Tools are needed to assist the CLF supply officer and the operational staffs to make stocking decisions which will maximize customer satisfaction.

The total amount of material to be carried on the CLF ship is not usually in question. The real decision is, "How much of the available space should be allocated to each item?" Therefore the quantity loading decisions are based on how the loading of a

particular item will help the ship accomplish its mission goal of filling customer demand. For example, if the CLF ship has room for only one case of frozen food and the Supply Officer can choose between a case of chicken or a case of Brussels sprouts, he or she should choose the item that will increase the ship's chances of satisfying the most customer demand during a support period. That is, if chicken is more likely to be ordered than Brussels sprouts, the Supply Officer should load a case of chicken.

This thesis advocates using marginal analysis as a tool to assist the CLF Supply Officer in making these loading decisions. The vehicle proposed to exploit marginal analysis is an algorithm programmed into an EXCEL spread sheet. The marginal benefit that an inventory item adds to a ship's mission is an appropriate means to compare items for stocking consideration. In order to determine the marginal benefit that a carried item adds to a CLF ship, a utility function must be defined. On a CLF ship, utility can be measured in terms of the ship's performance statistics. The critical statistic is called "Supply Effectiveness." Net supply effectiveness is defined as the number of requisitions filled by the ship divided by the total number of valid requisitions received by the ship. The proposed algorithm uses the expected increase in performance for each incremental increase in an item's stocking level to determine the mix of items that will maximize customer satisfaction.

Chapter II provides a detailed background discussion of the operational logistics environment in which CLF ships operate including the current methodology and procedures which determine the loading of CLF ships. Chapter III explains the theoretical framework for determining the loading sequence of a CLF ship given commodity demand distributions and a space constraint. Chapter IV develops the algorithm and uses actual CLF demand data from WESTPAC ships to illustrate how a spreadsheet based on the algorithm can be used as a decision making tool. Chapter V concludes the thesis with a summary of the algorithm's performance and offers recommendations for how the algorithm can be used.

II. BACKGROUND

A. CLF SHIP OPERATIONS

Atlantic and Pacific Fleet CLF ship operations are different in many respects, but many general practices apply to both. Many strides were made in recent years in fleet standardization and it is a continuing effort. Requisitioning procedures have been standardized and both Fleets carry the same line items. Operational disparity remains because of the geographical contrasts of the two oceans that dominate each fleet's operational areas. The Pacific theater's long logistical distances provide a less flexible operational environment while the short distances encountered in the Mediterranean Sea allow for more flexible use of CLF assets. For example, one Atlantic Fleet T-AFS can simultaneously service a battle group operating off the coast of Israel and one operating in the Adriatic Sea. A Pacific Fleet T-AFS cannot simultaneously service a battle group in the Indian Ocean and one in the Persian Gulf. The Area of Responsibility (AOR) in the Pacific is so large that distances limit logistics flexibility. This difference in flexibility has historically created two separate CLF philosophies, the station ship and the shuttle ship philosophies.

The station ship philosophy has the CLF ship steaming with the battle group and only leaving the operational area for a short time. A shuttle ship steams with the customer ships when providing direct support. But, it leaves the battle group to serve other customers or returns to a shore logistics site to load supplies. The Pacific Fleet historically has operated under the station ship philosophy because the ability of one CLF ship to support geographically separated battle groups was limited. The shuttle ship philosophy was dominant in the Atlantic Fleet because one CLF ship could realistically go from one battle group to another and provide support. During Desert Storm, the concentration of ships in the Persian Gulf allowed the Pacific Fleet to use the shuttle ship philosophy also. The shuttle ship philosophy is dependent on a resupply point to maintain stock levels on the primary CLF asset. Because of the dynamic world environment,

resupply pipelines are frequently not dependable and so the station ship concept is likely to emerge as the dominant strategy used in future operations. Current ship building efforts, USS SUPPLY (AOE-6) class, are designed around a station ship concept.

Both Atlantic and Pacific Fleet operational staffs provide loading guidance to CLF ships, but most effort is directed towards T-AFS class ships which are the workhorse of the Combat Logistics Force. The following two sections describe the guidance the staffs provide for these units. In the future, the other ship types of the CLF will increase in importance and new guidance will have to be developed to better load these ships. Currently, the other ship types are being loaded in an ad hoc manner and little data is available to evaluate the performance of the loading process.

B. CURRENT METHODOLOGY (ATLANTIC FLEET)

Atlantic Fleet CLF operations have almost exclusively centered on the Mediterranean Sea during the time of the Cold War. The major exceptions to this have been short exercises to the North Sea and sharing duties with the Pacific Fleet during Desert Storm. This stable environment has enabled the Atlantic Fleet staffs to establish reliable transportation pipelines and local sources of supply to assist the CLF ships in the Mediterranean. In this situation, initial loading of the CLF is important but not as critical as it would be with out this infrastructure. However, the ability to maintain this pipeline has depended on the availability of excess CLF assets. Currently, CLF assets are scarce so a pipeline from CONUS is not in place. According to Commander Naval Surface Force Atlantic (COMNAVSURFLANT) staff, a T-AFS is loaded in Norfolk, Virginia for an 86 day period of support in the Mediterranean and then is replaced by the next CLF ship in the rotation. Less capable CLF units such as AOE and AOR ships deploy with the battle group and fill gaps in T-AFS support.

COMNAVSURFLANT assists Atlantic Fleet CLF Supply Officers when they load their ships for deployment. A simple 12 month average is used to set the load quantities

and judgmental adjustment is made for intuitively seasonal items such as hot chocolate, ice cream and holiday foods. Hueristics are used to determine the stocking objectives in conjunction with the Average Monthly Demand (AMD) figures. For example, if one battle group is the anticipated customer base, 210% of AMD is the stocking objective. If the anticipated customer base is two battle groups, 310% of AMD is the objective. The reasoning behind this level setting is to treat 200% or 300% of AMD as the base inventory and 10% as the safety stock. This method is successful when demand is steady and the customer base is known, but COMNAVSURFLANT staff indicates that demand spikes are common and experience has shown these spikes can cause serious problems.

C. CURRENT METHODOLOGY (PACIFIC FLEET)

Pacific Fleet operating areas have been much more diverse than those of the Atlantic Fleet. Since 1990, Pacific Fleet battle groups and their CLF assets have operated in the Persian Gulf, off the coast of Bangladesh and Somalia and in operating areas near Australia and Korea. This unpredictable operational environment calls for the CLF ship to deploy fully loaded and makes stable logistical pipelines difficult to establish.

Commander Logistics Group, Western Pacific (COMLOGWESTPAC) assists Pacific Fleet CLF Supply Officers when they load out for deployment. Loading guidance is provided via Commander Logistics Support Force Seventh Fleet Notice 4423. The standard load is based on the most recent 12 months of demand data. The standard load is computed by finding the median of the demand data and then multiplying it by 3 to get a 3 month load. The median is used rather than the mean, because when the mean is used the T-AFS's storage space is often exceeded. The standard load for the Pacific Fleet is designed to be starting point for the loading process. The Supply Officer is expected to take the standard load and then adjust the totals up or down using additional customer information or his or her own experience. For example, the standard load may indicate that 1000 cases of individual canned juice should be loaded, but the battle group Aircraft

Carrier may have indicated that juices will be used for flight box lunches and it will need 3000 cases during the deployment. The CLF Supply Officer then adjusts the standard load accordingly

D. PROBLEM

CLF ship's Supply Officer, with assistance from operational staffs, load CLF ships with Food, Ship's Store material and High Usage Load List material without standardized guidance or inventory modeling tools. In the past, this has caused the following problems:

1. Customer service, measured by the ability to fully satisfy customer demands, has been inconsistent.
2. CLF ship Supply Officers have been forced to rely on secondary local sources of supply that were more expensive and of lessor quality than primary established sources when the initial load failed to satisfy customers during the support period.
3. Unexpected material shortages have resulted in the use of expensive high priority transportation channels to satisfy customer needs which the CLF ship was unable to meet.

The above problems have not been critical to logistics operations prior to the fall of the Soviet Union for two reasons. First, the stable operations which were characteristic of the cold war made it possible to adjust loads using established resupply pipelines to cover initial loading mistakes. Second, ample transportation dollars existed to expedite material shortages therefore minimizing the impact of shortages to the customer.

Today's unpredictable operating environment and stringent fiscal climate make the initial loading of the CLF essential to the success of its mission. Therefore, it is imperative that Supply Officers responsible for loading the CLF ship have the tools available that will assist them in maximizing customer satisfaction while efficiently using financial resources.

III. MODEL DEVELOPMENT

A. OBJECTIVE

The goal of this thesis is to develop a model that will help determine the optimum mix of material to be carried on a CLF ship. The objective of the model is to maximize the CLF ship's performance during a given period of support. The primary measure of CLF ship performance is called Supply Effectiveness. It measures the level of customer support which is provided to the deployed combat ships and units assigned to the CLF's operating area.

B. DEFINING A PERFORMANCE MEASURE (SUPPLY EFFECTIVENESS)

Supply effectiveness is currently defined as:

$$\textit{Supply Effectiveness } \% = \frac{\textit{Number of Requisitions Filled}}{\textit{Total Number of Requisitions Received}} X\ 100 \quad (3.1)$$

The number of requisitions filled includes partial requisitions filled. There is no distinction made between fully filled and partially filled requisitions.

However, this method of judging the performance of the CLF ship is not an accurate measure of customer satisfaction. The current method treats a partially filled requisition the same as a fully satisfied requirement. For example, USS FIFE submits a requisition to USNS SPICA requesting 10 cases of hamburger. SPICA transfers 5 cases to FIFE. Using the current effectiveness equation, the customer is considered fully satisfied, when in fact they were not. The current measurement provides an incentive to the CLF Supply Officer to manipulate the effectiveness percentages by increasing the number of

partially filled requisitions. For example, if the CLF ship is running low on a particular item, requisitions will be partially filled with small quantities to artificially boost the numerator in the supply effectiveness equation. This enables the Supply Officer to keep the supply effectiveness percentage at a point between 97 and 100% regardless of the amount of unsatisfied demand. Continually unrealistic effectiveness percentages have undermined the logistic commanders's confidence in the Supply Effectiveness performance measure and have caused more subjective measures of customer satisfaction, such as customer complaints, to dominate decision making. Objective and realistic performance measures are needed to evaluate stocking policies along with customer feedback.

This thesis proposes re-defining supply effectiveness based on units delivered vice requisitions filled or partially filled. The new measure will provide a more accurate measure of customer satisfaction because unfulfilled demand will be reflected in the percentage. The proposed equation for measuring Supply Effectiveness is:

$$Supply\ Effectiveness\ \ \% = \frac{Units\ of\ Demand\ Satisfied}{Units\ of\ Demand\ Requisitioned}\ X\ 100 \qquad (3.2)$$

C. APPROACH

Inventory decisions are normally based on determining the least total cost of stocking alternatives. This is done by determining when to order and what order quantity produces the minimized sum of ordering costs, holding costs, and stock out costs. However, the situation on the CLF ship is somewhat different from the typical inventory scenario. Because of the operational considerations described in Chapter I, the CLF will usually order only once. The CLF stays on station as long as it is able to serve its customers and then must be either re-supplied by or replaced by another CLF ship. In this

situation, ordering costs are not a decision factor because it is a single order quantity problem. CLF material holding costs are negligible since the material has already been paid for by the Navy and if it is not being held on the ship it will be stored in a shore warehouse. Consequently, the only relative holding cost is the cost of unloading unused material after a deployment. Shortage costs on the other hand are extremely high because the CLF ship is the primary source of supply for deployed customer ships operating in an area thousands of miles from any other supply source. These costs consist of either one or a combination of: (1) the cost of doing without the material; (2) the cost of returning to port for more of the material; (3) The cost of commercial water transportation to the theater of operations; (4) The cost of airlifting material to the theater of operations. This situation if analyzed by the traditional means would always point towards a stocking level exceeding the CLF ship's storage capacity. Thus, storage space becomes the critical constraint.

To assist the CLF Supply Officer in making loading decisions, the thesis proposes an algorithm based on marginal analysis to allocate the ship's storage space. The algorithm prioritizes the loading sequence of each case of material on the basis of its expected increase to the CLF ship's supply effectiveness. The expected increase is derived from the probability of satisfying demand for each inventory item given the demand distributions developed from historical CLF demand data.

D. MARGINAL ANALYSIS PRINCIPLES

Marginal analysis is normally used to make inventory decisions based on the premise that adding one more unit of inventory will either increase or decrease profit (a measure of performance). The optimal inventory is found at the point where the last added unit of inventory produces an increase in profit but one more unit would produce a loss.

Tersine [Ref. 1], illustrates this by determining the optimum stock out level and then choosing the inventory quantity that is expected to provide this level of customer satisfaction. The equation he uses is:

$$P(s) = \frac{ML}{MP + ML + A} \tag{3.3}$$

Where: P(s) = Probability of stockout

1 - P(s) = Customer Service Level

ML = Marginal Loss

MP = Marginal Profit

A = Stock out costs

Although, this method is effective for single order inventory decisions in civilian industry, the loading decisions encountered on the CLF do not correspond to this model. While profit and loss are relevant performance measures for commercial operations, supply effectiveness is the relevant performance measure for military operations.

The model this thesis proposes does not attempt to compare inventory quantities in terms of money, but makes comparisons based on the expected increase in service level per cubic feet the material occupies.

E. ALGORITHM ASSUMPTIONS

In developing the algorithm to assist the loading of CLF ships the following assumptions are made:

1. The distribution of future demand for each item will be similar to the historical demand pattern for each item.
2. The amount of space available on the CLF ship and the amount of space each item requires are known.
3. The relative importance of each item competing for the space is known.
4. Individual item demands are independent of each other.
5. Items are not directly substitutable.

F. ALGORITHM DEVELOPMENT

The problem on the CLF is to determine an optimum load mix that will maximize the supply effectiveness of the ship while not exceeding the ship's storage capacity. The algorithm can best be explained by a simplified example of the CLF inventory problem containing only two line items. The Lagrange multiplier technique from calculus is used to solve this simplified problem. The solution that is derived is the foundation for the spreadsheet described in the next section.

1. The Example's Given Information

(a) Items are designated as items "A" and "B".

(b) The variables in this example are defined as:

$F(X_A)$ is the cumulative distribution function of demand for item A.

$F(X_B)$ is the cumulative distribution function of demand for item B.

S_A is the space required for one unit of item A.

S_B is the space required for one unit of item B.

X_A is the number of units of item A to be loaded.

X_B is the number of units of item B to be loaded.

2. Problem Solution

***a. Step 1**: Determine the objective and constraint equations to be used in the Lagrange optimization.*

The objective function can be thought of as the reliability of a system made up of serially aligned components. Each line item behaves like a component in the series, because if an inventory item fails to meet a customer demand it is treated as a failure to the system. In a serial reliability problem, the reliability of each component is multiplied together to achieve the overall reliability of the system [Ref. 2]. The "reliability" of each inventory item is the probability of being able to satisfy or exceed demand. This probability is represented by the cumulative distribution function, F(X). The objective equation can be expressed as a generalized Cobb- Douglas function [Ref. 3]:

$$U = [F(X_A)]^{E_A} [F(X_B)]^{E_B} \tag{3.4}$$

where U represents the system "reliability", i. e., the supply effectiveness, and E_A and E_B are exponents that express the relative importance of each line item to the system.

The constraint equation states that the sum of storage space each item requires multiplied by the amount loaded must not exceed the total storage space available. The constraint is represented by:

$$S_T = S_A X_A + S_B X_B \tag{3.5}$$

where S_T represents the total storage space available.

b. Step 2: Set Up the Lagrangian Equation

The Lagrangian equation for this optimization is expressed as:

$$£ = [F(X_A)]^{E_A} [F(X_B)]^{E_B} + \lambda (S_T - S_A X_A - S_B X_B) \quad (3.6)$$

The Lagrangian multiplier, λ, can be regarded as the marginal supply effectiveness of an extra cubic foot of storage space.

c. Step 3: Solve the Lagrangian Equation

Solve the Lagrange equation by taking partial derivatives with respect to X_A, X_B, and λ and setting them equal to zero. The following first-order conditions for a constrained maximum result:

$$\frac{\partial U (X_A , X_B)}{\partial X_A} + S_A \lambda = 0 \quad (3.7)$$

$$\frac{\partial U (X_A , X_B)}{\partial X_B} + S_B \lambda = 0 \quad (3.8)$$

$$\frac{\partial £}{\partial \lambda} = S_T - S_A X_A - S_B X_B = 0 \quad (3.9)$$

Equation (3.9) simply repeats the constraint equation.

d. Step 4: Solve Equations (3.7) and (3.8) simultaneously for λ.

$$\lambda = - \left[\frac{\partial U\ (X_A\ ,\ X_B)}{\partial X_A}\right] \tag{3.10}$$

$$\lambda = - \left[\frac{\partial U\ (X_A\ ,\ X_B)}{\partial X_B}\right] \tag{3.11}$$

$$\frac{\left[\dfrac{\partial U\ (X_A\ ,\ X_B)}{\partial X_A}\right]}{S_A} = \frac{\left[\dfrac{\partial U\ (X_A\ ,\ X_B)}{\partial X_B}\right]}{S_B} \tag{3.12}$$

Equation (3.12) states that the marginal supply effectiveness per unit of space must be equal for A and B at the optimum.

Although this method provides a means to find an optimal mix of material to be stored in a given space constraint, it can be impractical to implement. First, the cumulative probability distribution function cannot be evaluated analytically, so numerical evaluation is necessary. Second, it becomes too cumbersome when working with more than two items. Finally, if the space constraint changes, the problem must be recalculated. The typical decision faced on the CLF is to find the optimal mix of over 50 line items based on empirical demand data when space constraints are frequently changing.

This thesis proposes using the same principles illustrated in the above example in a spreadsheet algorithm that compares the ratios of Equation (3.12) for a multitude of line items simultaneously. Also, if the space constraint changes, the spreadsheet can be easily altered to recompute a new solution.

The optimum level for the Lagrange solution is found where the ratios are equal for each competing item. The algorithm numerically compares the evaluation ratios of each line item against each other over a range of stocking levels and sorts these ratios in descending order to identify loading quantities that have approximately equal ratio values. The ratios are not exactly equal due to the discrete nature of the loading decisions. CLF loading decisions are made in discrete units, such as cases or pallets. While calculus equates the ratios over a continuous range, the algorithm provides a means to equate the evaluation ratios over a discrete range.

G. SPREADSHEET DEVELOPMENT

The proposed algorithm compares each line item of stock and provides a step-by-step approach to evaluating the relative impact on supply effectiveness of each added case of material . A Microsoft EXCEL spreadsheet provides an easy-to-use means to implement the algorithm.

There are three types of spreadsheets used in the thesis. The first type calculates the ratios for each line items which are similar to Equation (3.12). The second type consolidates specific information from all the line item spreadsheets into one spreadsheet. The third type sorts information from the second type and provides a prioritized list for loading material.

The remainder of this chapter summarizes the spreadsheet algorithm by explaining what each sheet accomplishes and how the sheets are linked together to produce a decision making tool. A detailed explanation of the spreadsheets including column, row and cell interactions is provided in Appendix (A). An illustrative example of the implementation of the spreadsheet algorithm is provided in Appendix (B).

The first goal of the algorithm is to produce a cumulative demand distribution function for each line item of material to be loaded. The example uses six log normally distributed line items. By converting the raw data to their natural logarithms, the data can

be treated as being normally distributed and a cumulative distribution for the normalized data can be created. One of the example's line items, french fries, is a representative illustration of the shape of the normal cumulative distribution function (Figure 3.1).

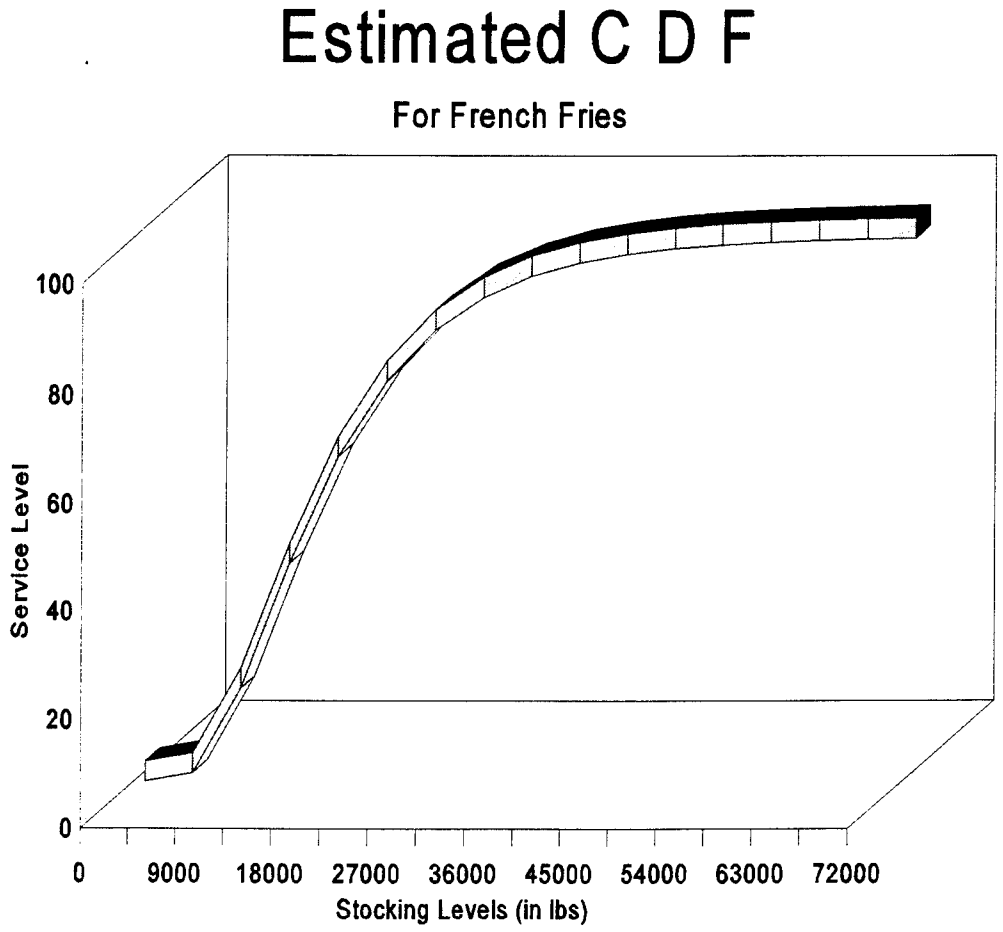

Figure 3.1. Estimated cumulative distribution function for french fries.

Using the cumulative distribution data, the derivative of the CDF is estimated by calculating the service level differences as stocking level is increased (Figure 3.2).

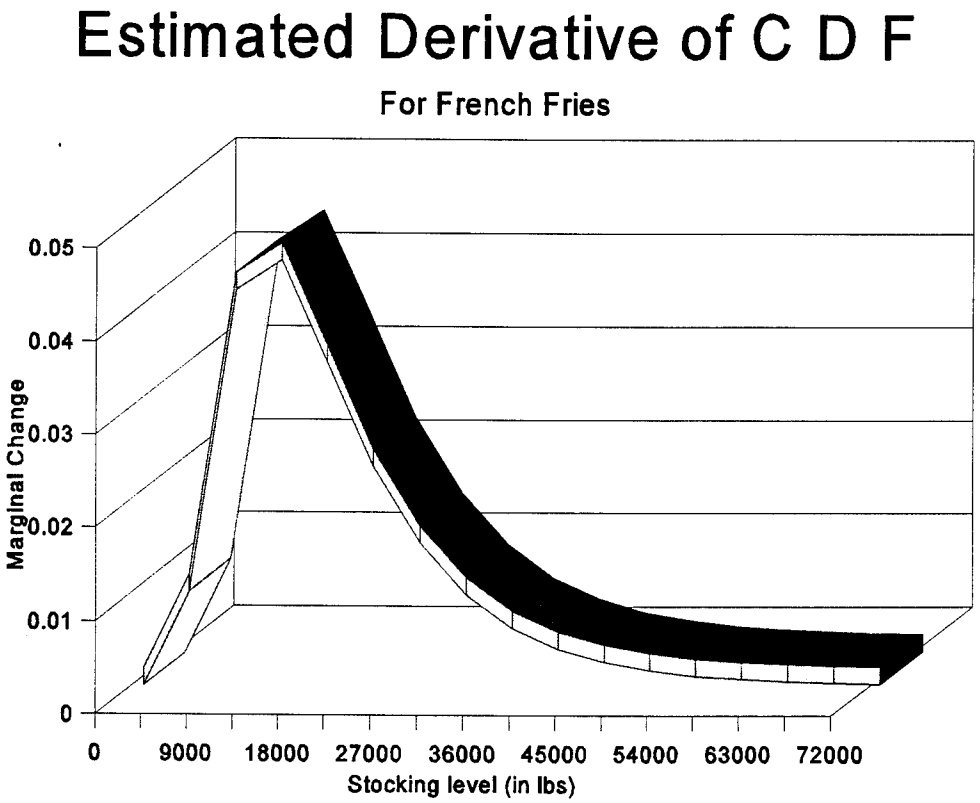

Figure 3.2. Estimated derivative of the cumulative distribution function for french fries.

The algorithm uses the estimated cumulative distribution function and the estimated derivative of that function to calculate the ratios in Equation (3.12). However the ratio used for the spreadsheet algorithm is derived from a specialized case of the Equation (3.4) objective function. In the spreadsheet algorithm objective function, the exponents E_A and E_B are equal to one, because the line items in the example are assumed to have the same relative importance and one was chosen as the exponent value for ease of

computation. These ratios are the basis for evaluating stocking levels. Figure (3.3) illustrates the ratio for french fries. The ratio decreases as stock is added showing the diminishing returns realized by adding more stock. This provides a means of prioritizing the loading of each item.

The next step is to limit the stocking levels that will be included in the evaluation. This is accomplished by evaluating the stocking levels from zero to an upper limit. The upper limit is defined by the stocking level where exclusive loading of a line item will cause the total space constraint to be exceeded.

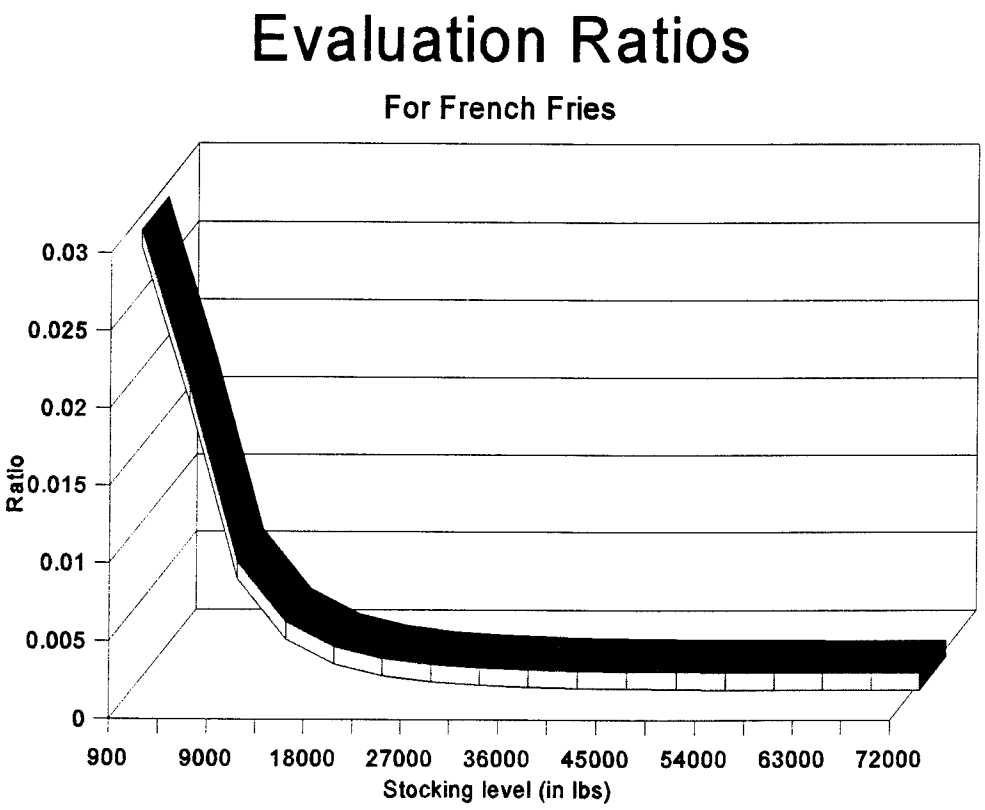

Figure 3.3 Evaluation ratios for french fries.

The next step in the algorithm is to consolidate the ratios calculated in each Type 1 spreadsheet, so a comparison can be made between line items. Once the information is consolidated, it is moved to the Type 3 spreadsheet for analysis.

The final spreadsheet numerically compares the evaluation ratios for each line item by sorting the "Evaluation Ratio" columns in descending order. This creates a prioritized list for loading. The prioritized list will be loaded in sequence until the space constraint is met. When the space constraint is reached, the sum of the units loaded is equal to the optimum load levels.

IV. MODEL EVALUATION

A. EVALUATION EXPLANATION

An example problem is analyzed to evaluate the algorithm. Six food products carried on Fast Combat Stores Ships (T-AFS) are evaluated. The data is taken from actual historical demand collected by the author when working for Commander Logistics Group, Western Pacific and is known to be accurate. To minimize the chance of inconsistency between issue data and demand data, high demand critical items were selected that did not experience significant stockouts. Further, the line items were chosen because they closely follow the model assumptions and typically compete for the same space. Specifically, they are items which have similar importance, are independent of each other; and are not direct substitutes for each other.

In the example, the algorithm is compared against both the Atlantic and Pacific Fleet methods of loading the CLF. However the demand data is only from the Pacific Fleet. Both fleet's methods, as described in Chapter II, use the past 12 months demand to determine a stocking level. The Pacific Fleet load is determined by tripling the item's median monthly demand to provide a "90 day load." The "90 day load" is designed to provide support to the CLF ship's customers for a three month deployment cycle. The Atlantic fleet load is determined by multiplying each line item's average monthly demand by 3.1 and is termed the "3.1 AMD load." The Atlantic Fleet load is designed to accomplish the same mission as the Pacific Fleet load, but support is provided for a different customer base. The analysis is accomplished by comparing each method with the thesis algorithm separately.

The comparison between the Pacific Fleet method and the thesis algorithm is accomplished by calculating the space required for the example load using the Pacific Fleet method and using that figure for the space constraint of the algorithm. This provides a means of comparing the two decision methods under similar conditions. The comparison

with the Atlantic Fleet is accomplished in the same manner, but the space constraint of the algorithm is determined by the load calculated using the Atlantic Fleet method.

B. PACIFIC FLEET COMPARISON

The Pacific fleet method and the method developed in the thesis are compared in Figure (4.1). The units used to load the T-AFS are pallets of material. The cubic feet occupied by each line item is also listed.

Item	Pacific Fleet Pallets	Pacific Fleet Cubic Feet	Algorithm Pallets	Algorithm Cubic Feet
Oven Roast	24	730.8	32	974.4
Pork Chops	12	450.0	20	750.0
Bacon	25	962.5	29	1116.5
Frankfurters	25	847.5	28	949.2
Ground Beef	54	1895.4	49	1719.9
Chicken	81	2693.2	62	2061.5
	Total Space	7579.4	**Total Space**	7571.5

Figure 4.1. Space occupied: Pacific Fleet method vs. proposed algorithm.

To analyze the loading decisions made in Figure (4.1), the pallet counts are evaluated using the estimated cumulative distributions for each line item that were derived in Chapter III. Since the cumulative distribution functions represent the expected service level provided for each line item, an overall service level can be determined for the six items of the example. Figure (4.2) lists the expected service level for each line item using the Pacific Fleet method and for the proposed algorithm. Higher service levels indicate a higher probability that the CLF will fulfill all of its customer's needs. The load's overall

service level is determined by multiplying all of the individual line item's services levels together. This is a measurement of the overall "reliability" of the inventory system. In the example, the thesis algorithm significantly outperforms the Pacific Fleet's method. The algorithm achieved a 70% increase in inventory "reliability," i. e., supply effectiveness.

Item	Pacific Fleet Pallets	Pacific Fleet "Reliability"	Algorithm Pallets	Algorithm "Reliability"
Oven Roast	24	43.4%	32	74.1%
Pork Chops	12	34.8%	20	72.0%
Bacon	25	28.6%	29	35.3%
Frankfurters	25	59.4%	28	69.3%
Ground Beef	54	46.0%	49	38.3%
Chicken	81	58.6%	62	32.9%
Total	**"Reliability"**	.7%	**"Reliability"**	1.6%

Figure 4.2. Reliability: Pacific Fleet method vs. proposed algorithm.

Also, this increase is slightly understated because the algorithm uses 7.95 less cubic feet of space than the Pacific Fleet method. The additional space could be filled with an item of the Supply Officer's choice to further increase inventory "reliability."

Inspection of Figure (4.2) indicates that the algorithm outperforms the Pacific Fleet method by finding the best overall mix of material to maximize customer satisfaction. It does not try to optimize each item independently. The algorithm treats the inventory items together as a system to optimize the overall inventory system performance. The algorithm indicates that better use of the CLF storage space can be achieved by loading more oven roast, pork chops, bacon, and frankfurters and less ground beef and chicken. Greater overall customer satisfaction can be achieved using the same storage space.

C. ATLANTIC FLEET COMPARISON

The comparison between the Atlantic Fleet method and the thesis algorithm is accomplished in the same manner as is done with the Pacific's. The pallet count and the cubic feet of space occupied is listed in Figure (4.3).

Item	Atlantic Fleet Pallets	Atlantic Fleet Cubic Feet	Algorithm Pallets	Algorithm Cubic Feet
Oven Roast	28	852.6	36	1096.2
Pork Chops	17	637.5	24	900.0
Bacon	54	2079.0	40	1540.0
Frankfurters	25	847.5	33	1118.7
Ground Beef	64	2246.4	61	2141.1
Chicken	81	2693.3	77	2560.3
	Total Space	9356.3	**Total Space**	9356.3

Figure 4.3. Space occupied: Atlantic Fleet method vs. proposed algorithm.

The cumulative distributions are again used to determine the "reliability" of each line item. The overall inventory "reliability" is calculated by multiplying all the individual line item service levels together (Figure 4.4).

In this part of the example, the thesis algorithm also outperforms the Atlantic Fleet's method. The algorithm produced a 60% increase in inventory "reliability," i. e., supply effectiveness.

Item	Atlantic Fleet Pallets	Atlantic Fleet "Reliability"	Algorithm Pallets	Algorithm "Reliability"
Oven Roast	28	60.6%	36	83.6%
Pork Chops	17	60.8%	24	82.4%
Bacon	54	65.7%	40	51.1%
Frankfurters	25	59.4%	33	81.3%
Ground Beef	64	59.6%	61	55.8%
Chicken	81	58.6%	77	53.7%
Total	**"Reliability"**	5.0%	**"Reliability"**	8.6%

Figure 4.4. Reliability: Atlantic Fleet method vs. proposed algorithm.

Here again the algorithm selects a different item mix than the current method. The algorithm achieves a higher level of supply effectiveness within the same space constraint by loading more oven roast, pork chops, and frankfurters, but less bacon, ground beef, and chicken. The algorithm makes stocking decisions based on the overall system "reliability," not based on the individual "reliability" of each item. If item stocking decisions are considered separately, local optimum stocking levels may be determined that do not maximize overall customer satisfaction. By considering the inventory as a system, a global optimum level can be determined which will maximize customer satisfaction.

V. RECOMMENDATIONS AND CONCLUSIONS

A. RECOMMENDATIONS

1. Re-define Supply Effectiveness

Re-define supply effectiveness based on units of inventory delivered to the customer vice the number of requisitions filled or partially filled by the CLF ship. The proposed equation for measuring supply effectiveness is Equation (3.3) . This percentage will provide an objective and realistic performance measure to evaluate stocking decisions.

2. Demand Data Collection

Regardless of the method used to determine stocking levels for CLF ships, accurate demand data is paramount to making sound inventory decisions. During the research and preparation of this thesis several inaccuracies and procedural flaws were discovered associated with the collection of demand data. The most disturbing problems are: (1) demand data is frequently collected as issue data; (2) transfers to other CLF ships are sometimes treated as demands; (3) data collection is not accomplished using standard procedures.

Issue data and demand data are equal only when stock outs, partial issues, and incorrect issues do not occur. Unfortunately, all three of these phenomenon occur on a regular basis. Stock outs and partial issues result in much lower demand being recorded than is actually occurring and incorrect issues cause errors in both directions. To make matters worse, underestimating demand can cause an inventory manager to carry less of an item and therefore increase the chances of future stock outs. This vicious cycle, if unnoticed, can cause recurring problems with inventory items experiencing this inaccurate demand reporting phenomenon. Caution must be taken when recording a customer's requisitions as demand. If the requisition is not fully filled and stock outs occur over several requisition cycles, customers may place repeat orders for the same material,

inflating demand for those products. This occurs because unfilled requisitions are canceled. They are not placed in a back order status.

Demand should only be recorded when a consumer places an order. Recording transfers between CLF ships as demand can quickly inflate recorded demand, because double counting occurs. For example, USNS SAN DIEGO (T-AFS-6) transfers material to USNS CONCORD (T-AFS-5) and records the issue as demand. CONCORD transfers the same material to USS WHIDBEY ISLAND (LSD-41) who consumes it and CONCORD records the demand a second time. Requisitions from other CLF units should be coded as either for "own ships use" or "for fleet transfer" to avoid double counting.

Data collection should be accomplished in a standard way. Each ship adopts its own method and uses different software and hardware to accomplish this task. Spreadsheets are the most prevalent means to collect demand. These spreadsheets provide a quick and easy way to keep track of past demand, but no standard procedures or program is used. This makes transfer of data between CLF ships and the operational staff difficult. Paper copies of the data are either sent through the mail, faxed or transmitted by Naval Message and then the information is key punched into the staff's spreadsheet. Standard demand collection procedures utilizing a single spreadsheet application program would improve accuracy and allow for the efficient transfer of information between ships and staff.

3. Implementation of the Algorithm

Although the algorithm can accept a large number of items, the CLF Supply Officer can best use the algorithm by breaking the loading process down into small pieces. This is done for two reasons. First, when 25 or more line items are analyzed in the thesis spreadsheet, computing becomes slow and many desktop machines (486DX66 or less) will be unable to efficiently provide a solution. Second, the line items can be separated into groups to more closely match model assumptions. Specifically, grouping the items by

importance will allow the objective function exponents to be equal to one and restricting substitutes and compliments allow the use of the serial reliability concept.

The space on the ship can be subdivided into storage areas and product groups can be assigned to the designated areas. The items should be grouped by relative importance and should neither be substitutes nor compliments of each other. Sensitivity analysis can be performed to adjust the space allocations for each group to ensure the service level of mission critical material is maintained at an acceptable level.

4. Further Research

The spreadsheet algorithm presented in this thesis can be used to assist the CLF Supply Officer in making loading decisions when the assumptions of the spreadsheet example apply. The assumptions that restrict the application of the spreadsheet the most are: (1) items are of the same importance and (2) items are not directly substitutable. For example, if a loading decision is to decide the proper mix of candy bars to be carried by the T-AFS, the relative importance of each item is the same and substitutability is high. But, if the loading decision is between toilet paper, oil filters and six kinds of tabulating paper, the relative importance is critical. The consequences of running out of oil filters may be an expensive repair. Running out of toilet paper will cause serious morale problems. Running out of one kind of tabulating paper may go unnoticed due to substitutability. For the spreadsheet to be useful in this instance, it could assign different weights to each item and consider how substitution effects those weights. By revising the objective equation and evaluation ratio, the present spreadsheet algorithm can be used without major revision. However, further research could be directed to explicitly incorporate importance and substitutability effects.

B. CONCLUSION

The purpose of this thesis is to provide a management tool for CLF Supply Officers to better load their ships. To do this, an algorithm based on marginal analysis is developed. The algorithm produces a prioritized list of items in their optimal loading sequence. The Supply Officer determines the amount of space that is available and then loads items, in sequence, from the prioritized list until the space is filled. This improved loading process will enable the CLF ship to better serve its customers.

The algorithm performs better than both the Pacific and Atlantic Fleet methods currently used. This improvement is significant, but does not represent the greatest strength of the model. The strength of the model can be found in its flexibility. The current models only provide one level of loading, which may or may not exceed the storage space available. For example, if the current models produce a load that will not fit on the CLF ship, what should the Supply Officer leave behind? Or, if the load is placed on the ship and more room is available, what items should be loaded in the extra space? The thesis algorithm provides the loads that can precisely match the available space with the highest possible level of customer service. Recalculation is not necessary unless a line item is added or deleted.

In summary, the algorithm is a management tool that will enhance the ability of the CLF Supply Officer to better serve the fleet customer. The algorithm is: (1) consistent, (2) objective, (3) realistic, (4) easy-to-use, and (5) updatable.

Furthermore, the thesis algorithm is not limited to use on a CLF ship. The model is generic enough to be applied to any inventory problem where a demand distribution is known and space is the limiting factor in determining stocking levels. For example, the algorithm may be used to load inventory on Maritime Prepositioning Ships which are used to support a Marine Corps Expeditionary Brigade for thirty days. Loading these ships is also a single order problem with space as the relevant constraint. The concept and

algorithm presented in this thesis works with any demand distribution and any inventory material.

APPENDIX A: DETAILED SPREADSHEET EXPLANATION

The algorithm is made up of three different spreadsheet types. The first type evaluates each line items contribution to the inventory system. The algorithm contains as many of these spreadsheets as there are line items to be considered. The second and third types of spreadsheet consolidate the evaluated data and compare it so a stocking decision can be made. There are only one each of these spreadsheets in the algorithm.

Excerpts from each of these spreadsheet types are provided in this appendix following the explanations. The numbers highlighted on the spreadsheets correspond to the step numbers found in the detailed explanations.

Type 1 Spreadsheet Explanation

Step 1. Convert raw data from a lognormal pattern to a normal distribution.

Since the lognormal distribution is assumed, calculate the natural logarithm of the raw demand data (row "3") using the "LN" function. This enables the data to be treated as being normally distributed.

Step 2. Find the mean and standard deviation

Calculate the mean of the converted data (row "4") as if the data fits a normal distribution using the "AVG" function (cell "B6"). Calculate the standard deviation of the converted data (row "4") using the "STDEV" function (cell "B7").

Step 3. Determine the possible stocking levels for each item.

The possible stocking level for each item are listed in the first and second columns in the spreadsheet. The first column is the number of possible pallets (a pallet consists of 30 to 42 cases) and the second column is the number of pallets converted to units of issue. Both columns start at zero and then increase in full pallet increments. Both columns

continue until the number of pallets, multiplied by the cubic feet per pallet (cell "H12") is equal to the overall storage constraint (cell "F10"). For example, a pallet of french fries contain thirty 30 lb cases of fries. The units of issue stocking level (column "B") for this example would increase in multiples of 900 lbs (30 X 30) until it reaches a storage constraint.

Step 4. Convert possible stocking levels to their natural logarithms.

Convert the possible stocking levels (column "B") to the same units of measurement as the mean (cell "B6") and standard deviation (cell "B7") of the demand data.

Step 5. Estimate the cumulative distribution function (CDF) of demand.

Calculate the estimated CDF using the "NORMDIST" function. The parameters of the normal curve are estimated by the converted mean (cell "B6") and standard deviation (cell "B7"). The "x" values are taken from the natural logarithm of the stocking levels (column "C"). After the calculations are completed the CDF (column "D") is changed to a percentage by multiplying it by 100. The CDF is considered an estimation because the increments of "x" must be infinitely small to precisely show the CDF.

Step 6. Estimate the Probability Distribution Function(pdf).

Estimate the pdf by calculating the difference between each incremental change of the CDF (column "D").

Step 7. Recopy Stocking Level .

Copy potential stocking level (column "B") to evaluated stocking level (column "F"). This will assist in the process of consolidating each line item to a single sheet.

Step 8. Calculate the Evaluation Ratio.

Calculate the evaluation ratio that was derived in Chapter 3 in the section on algorithm development. The ratio is created by dividing the estimated pdf (column "E") by the CDF (column "D") multiplied by the cubic feet occupied by one pallet of material (cell "H12").

Type 2 Spreadsheet Explanation.

The type 2 spreadsheet is created by copying the evaluated stocking level (column "F") and the evaluated ratio (column "G") from each type 1 spreadsheet and consolidating them. This is accomplished by copying the first line item to a new spreadsheet and then copying each successive line item to the proceedings columns end. The consolidated columns form a single large column with a significant amount of blank cells between line items. The final step in this spreadsheet is to remove those blank cells. EXCEL can easily accomplish this task by filtering out the blank cells.

Type 3 Spreadsheet Explanation.

Step 1. Prioritize a stocking list.

A prioritized list is established by copying the item (column "A"), the evaluated stocking level (column "B"), and the evaluated ratio (column "C") from the type 2 spreadsheet. The three columns are copied next to a numbered column and are sorted by the evaluated ratio in descending order. This produces a list that represents the sequence of loading.

Step 2. Count the number of pallets that are to be loaded at a particular space constraint.

Create a column for each line item that counts the number of pallets that should be loaded according to the loading sequence. The count is accomplished by using the "DCOUNT" function.

Step 3. Determine the space each line item occupies.

Calculate the space each line item occupies by multiplying the space occupied for one pallet (row "3") and the count determined in step 2.

Step 4. Determine the total space occupied.

Calculate the total space occupied for each point of the loading sequence by adding the space occupied for each line item (columns "F", "H", "J", "L", "N", and "P")

Step 5. Locate the point in the sequence when the space constraint is reached.

Find the recommended load by locating the point where the space constraint is reached. This is accomplished by putting a decision function in the total space occupied column (column "Q"). The total space column stops when the space constraint is reached.

Step 6. Find the recommended stocking levels.

The row just prior to surpassing the space constraint contains the recommended stocking level (row "82"). The load numbers are found in the item columns ("E", "G", "I", "K", "M", and "O").

	A	B	C	D	E	F	G	H
1	ITEM	JAN	FEB	MAR	MAY	JUN	JUL	SEP
2		SAT	SAT	SAT	SJO	SJO	SJO	NFL
3	French	30030	28820	36705	15960	18574	17280	11400
4	Fries	10.31	10.27	10.51	9.68	9.83	9.76	9.34
5								
6	Mean &	9.65						
7	Std Dev	0.58						
8	of Ln							
9								
10				Total Space Constraint		2,820 sqft		
11								
12		Case Cube	1.17		Cases per		Pallet	35.10
13		Case pack	30		Pallet	30	Cube	
14		Max # of pallets				80		
15								
16	Number	Potential	Ln of	Est Cum	Est Prob	Eval	Eval	
17	of pallet	Stocking	Stock	Distribution	Distribution	Stocking	Ratio	
18	levels	levels	Levels	Function	Function	Level		
19		3	4	5	6	7	8	
20	1	900	6.802	0.00%	0.000000	900	0.028490	
21	2	1800	7.496	0.01%	0.000089	1800	0.028373	
22	3	2700	7.901	0.12%	0.001079	2700	0.026321	
23	4	3600	8.189	0.55%	0.004313	3600	0.022421	
24	5	4500	8.412	1.55%	0.010058	4500	0.018441	
25	6	5400	8.594	3.29%	0.017406	5400	0.015052	
26	7	6300	8.748	5.81%	0.025119	6300	0.012325	
27	8	7200	8.882	9.03%	0.032199	7200	0.010163	
28	9	8100	9.000	12.83%	0.038047	8100	0.008448	
29	10	9000	9.105	17.07%	0.042420	9000	0.007079	
30	11	9900	9.200	21.60%	0.045314	9900	0.005976	
31	12	10800	9.287	26.29%	0.046870	10800	0.005079	
32	13	11700	9.367	31.02%	0.047293	11700	0.004344	
33	14	12600	9.441	35.70%	0.046806	12600	0.003735	
34	15	13500	9.510	40.26%	0.045621	13500	0.003228	
35	16	14400	9.575	44.66%	0.043925	14400	0.002802	
36	17	15300	9.636	48.84%	0.041879	15300	0.002443	
37	18	16200	9.693	52.80%	0.039610	16200	0.002137	
38	19	17100	9.747	56.53%	0.037220	17100	0.001876	
39	20	18000	9.798	60.01%	0.034789	18000	0.001652	
40	21	18900	9.847	63.24%	0.032374	18900	0.001458	
41	22	19800	9.893	66.24%	0.030018	19800	0.001291	
42	23	20700	9.938	69.02%	0.027752	20700	0.001146	
43	24	21600	9.980	71.58%	0.025594	21600	0.001019	
44	25	22500	10.021	73.94%	0.023557	22500	0.000908	
45	26	23400	10.060	76.10%	0.021647	23400	0.000810	
46	27	24300	10.098	78.09%	0.019866	24300	0.000725	
47	28	25200	10.135	79.91%	0.018212	25200	0.000649	

Evaluation Item	Evaluation Level	Evaluation Ratio
Pork chops	1500	0.026667
Pork chops	3000	0.026612
Pork chops	4500	0.025116
Pork chops	6000	0.021699
Pork chops	7500	0.017918
Pork chops	9000	0.014575
Pork chops	10500	0.011837
Pork chops	12000	0.009651
Pork chops	13500	0.007915
Pork chops	15000	0.006533
Pork chops	16500	0.005426
Pork chops	18000	0.004533
Pork chops	19500	0.003806
Pork chops	21000	0.003212
Pork chops	22500	0.002722
Pork chops	24000	0.002316
Pork chops	25500	0.001977
Pork chops	27000	0.001694
Pork chops	28500	0.001455
Pork chops	30000	0.001253
Pork chops	31500	0.001082
Pork chops	33000	0.000936
Pork chops	34500	0.000812
Pork chops	36000	0.000705
Pork chops	37500	0.000614
Pork chops	39000	0.000535
Pork chops	40500	0.000467
Pork chops	42000	0.000409
Pork chops	43500	0.000358
Pork chops	45000	0.000314
Pork chops	46500	0.000276
Pork chops	48000	0.000242
Pork chops	49500	0.000213
Pork chops	51000	0.000188
Pork chops	52500	0.000166
Pork chops	54000	0.000147
Pork chops	55500	0.000130
Pork chops	57000	0.000115
Pork chops	58500	0.000102
Pork chops	60000	0.000090
Pork chops	61500	0.000080
Pork chops	63000	0.000071
Pork chops	64500	0.000063
Pork chops	66000	0.000056
Pork chops	67500	0.000050
Pork chops	69000	0.000045

This spreadsheet consists of 26 pages. The rest of the line items follow pork chops in these same columns.

TYPE 3 SPREADSHEET

Pri	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
					30.45		**37.50**		**38.50**		**33.90**		**35.10**		**33.25**	
1	Oven Roast	3500	0.03284	1	30.45											30.45
2	Oven Roast	5250	0.03283	2	60.90											60.90
3	Oven Roast	7000	0.03255	3	91.35											91.35
4	Oven Roast	8750	0.03153	4	121.80											121.80
5	Chicken	4200	0.03008	4	121.80									1	33.25	155.05
6	Chicken	5600	0.02994	4	121.80									2	66.50	188.30
7	Oven Roast	10500	0.02938	5	152.25									2	66.50	218.75
8	Frankfurters	1200	0.02950	5	152.25					1	33.90			2	66.50	252.65
9	Frankfurters	2400	0.02950	5	152.25					2	67.80			2	66.50	286.55
10	Chicken	7000	0.02946	5	152.25					2	67.80			3	99.75	319.80
11	Frankfurters	3600	0.02932	5	152.25					3	101.70			3	99.75	353.70
12	Chicken	8400	0.02851	5	152.25					3	101.70			4	133.00	386.95
13	Ground Beef	1650	0.02849	5	152.25					3	101.70	1	35.10	4	133.00	422.05
14	Ground Beef	3300	0.02849	5	152.25					3	101.70	2	70.20	4	133.00	457.15
15	Ground Beef	4950	0.02836	5	152.25					3	101.70	3	105.30	4	133.00	492.25
16	Frankfurters	4800	0.02815	5	152.25					4	135.60	3	105.30	4	133.00	526.15
17	Ground Beef	6600	0.02754	5	152.25					4	135.60	4	140.40	4	133.00	561.25
18	Oven Roast	12250	0.02733	6	182.70					4	135.60	4	140.40	4	133.00	591.70
19	Chicken	9800	0.02719	6	182.70					4	135.60	4	140.40	5	166.25	624.95
20	Pork chops	1500	0.02667	6	182.70	1	37.50			4	135.60	4	140.40	5	166.25	662.45
21	Pork chops	3000	0.02661	6	182.70	2	75.00			4	135.60	4	140.40	5	166.25	699.95
22	Bacon	1575	0.02597	6	182.70	2	75.00	1	38.50	4	135.60	4	140.40	5	166.25	738.45
23	Ground Beef	8250	0.02594	6	182.70	2	75.00	1	38.50	4	135.60	5	175.50	5	166.25	773.55
24	Frankfurters	6000	0.02588	6	182.70	2	75.00	1	38.50	5	169.50	5	175.50	5	166.25	807.45
25	Chicken	11200	0.02565	6	182.70	2	75.00	1	38.50	5	169.50	5	175.50	6	199.50	840.70
26	Bacon	3150	0.02542	6	182.70	2	75.00	2	77.00	5	169.50	5	175.50	6	199.50	879.20
27	Pork chops	4500	0.02512	6	182.70	3	112.50	2	77.00	5	169.50	5	175.50	6	199.50	916.70
28	Oven Roast	14000	0.02475	7	213.15	3	112.50	2	77.00	5	169.50	5	175.50	6	199.50	947.15
29	Chicken	12600	0.02402	7	213.15	3	112.50	2	77.00	5	169.50	5	175.50	7	232.75	980.40
30	Ground Beef	9900	0.02389	7	213.15	3	112.50	2	77.00	5	169.50	6	210.60	7	232.75	1015.50
31	Frankfurters	7200	0.02307	7	213.15	3	112.50	2	77.00	6	203.40	6	210.60	7	232.75	1049.40
32	Chicken	14000	0.02239	7	213.15	3	112.50	2	77.00	6	203.40	6	210.60	8	266.00	1082.65
33	Oven Roast	15750	0.02218	8	243.60	3	112.50	2	77.00	6	203.40	6	210.60	8	266.00	1113.10

TYPE 3 SPREADSHEET

Pri	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
255	Bacon	56700	0.00080	35	1065.75	23	862.50	36	1386.00	32	1084.80	57	2000.70	72	2394.00	8793.75
256	Chicken	105000	0.00078	35	1065.75	23	862.50	36	1386.00	32	1084.80	57	2000.70	73	2427.25	8827.00
257	Ground Beef	95700	0.00077	35	1065.75	23	862.50	36	1386.00	32	1084.80	58	2035.80	73	2427.25	8862.10
258	Bacon	58275	0.00076	35	1065.75	23	862.50	37	1424.50	32	1084.80	58	2035.80	73	2427.25	8900.60
259	Chicken	106400	0.00075	35	1065.75	23	862.50	37	1424.50	32	1084.80	58	2035.80	74	2460.50	8933.85
260	Ground Beef	97350	0.00074	35	1065.75	23	862.50	37	1424.50	32	1084.80	59	2070.90	74	2460.50	8968.95
261	Frankfurters	39600	0.00072	35	1065.75	23	862.50	37	1424.50	33	1118.70	59	2070.90	74	2460.50	9002.85
262	Chicken	107800	0.00072	35	1065.75	23	862.50	37	1424.50	33	1118.70	59	2070.90	75	2493.75	9036.10
263	Bacon	59850	0.00072	35	1065.75	23	862.50	38	1463.00	33	1118.70	59	2070.90	75	2493.75	9074.60
264	Oven Roast	64750	0.00071	36	1096.20	23	862.50	38	1463.00	33	1118.70	59	2070.90	75	2493.75	9105.05
265	Ground Beef	99000	0.00071	36	1096.20	23	862.50	38	1463.00	33	1118.70	60	2106.00	75	2493.75	9140.15
266	Pork chops	36000	0.00071	36	1096.20	24	900.00	38	1463.00	33	1118.70	60	2106.00	75	2493.75	9177.65
267	Chicken	109200	0.00069	36	1096.20	24	900.00	38	1463.00	33	1118.70	60	2106.00	76	2527.00	9210.90
268	Bacon	61425	0.00068	36	1096.20	24	900.00	39	1501.50	33	1118.70	60	2106.00	76	2527.00	9249.40
269	Ground Beef	100650	0.00068	36	1096.20	24	900.00	39	1501.50	33	1118.70	61	2141.10	76	2527.00	9284.50
270	Chicken	110600	0.0006	36	1096.2	24	900.00	39	1501.50	33	1118.70	61	2141.10	77	2560.25	9317.75
271	Bacon	63000	0.00065	36	1096.20	24	900.00	40	1540.00	33	1118.70	61	2141.10	77	2560.25	9356.25
272	Ground Beef	102300	0.00065	36	1096.20	24	900.00	40	1540.00	33	1118.70	62	2176.20	77	2560.25	
273	Frankfurters	40800	0.00065	36	1096.20	24	900.00	40	1540.00	34	1152.60	62	2176.20	77	2560.25	
274	Chicken	112000	0.00064	36	1096.20	24	900.00	40	1540.00	34	1152.60	62	2176.20	78	2593.50	
275	Oven Roast	66500	0.00062	37	1126.65	24	900.00	40	1540.00	34	1152.60	62	2176.20	78	2593.50	
276	Ground Beef	103950	0.00062	37	1126.65	24	900.00	40	1540.00	34	1152.60	63	2211.30	78	2593.50	
277	Bacon	64575	0.00062	37	1126.65	24	900.00	41	1578.50	34	1152.60	63	2211.30	78	2593.50	
278	Chicken	113400	0.00061	37	1126.65	24	900.00	41	1578.50	34	1152.60	63	2211.30	79	2626.75	
279	Pork chops	37500	0.00061	37	1126.65	25	937.50	41	1578.50	34	1152.60	63	2211.30	79	2626.75	
280	Ground Beef	105600	0.00059	37	1126.65	25	937.50	41	1578.50	34	1152.60	64	2246.40	79	2626.75	
281	Chicken	114800	0.00059	37	1126.65	25	937.50	41	1578.50	34	1152.60	64	2246.40	80	2660.00	
282	Bacon	66150	0.00059	37	1126.65	25	937.50	42	1617.00	34	1152.60	64	2246.40	80	2660.00	
283	Frankfurters	42000	0.00058	37	1126.65	25	937.50	42	1617.00	35	1186.50	64	2246.40	80	2660.00	
284	Chicken	116200	0.00057	37	1126.65	25	937.50	42	1617.00	35	1186.50	64	2246.40	81	2693.25	
285	Ground Beef	107250	0.00057	37	1126.65	25	937.50	42	1617.00	35	1186.50	65	2281.50	81	2693.25	
286	Bacon	67725	0.00056	37	1126.65	25	937.50	43	1655.50	35	1186.50	65	2281.50	81	2693.25	
287	Oven Roast	68250	0.00055	38	1157.10	25	937.50	43	1655.50	35	1186.50	65	2281.50	81	2693.25	
288	Chicken	117600	0.00055	38	1157.10	25	937.50	43	1655.50	35	1186.50	65	2281.50	82	2726.50	
289	Ground Beef	108900	0.00054	38	1157.10	25	937.50	43	1655.50	35	1186.50	66	2316.60	82	2726.50	
290	Pork chops	39000	0.00054	38	1157.10	26	975.00	43	1655.50	35	1186.50	66	2316.60	82	2726.50	

APPENDIX B. CHAPTER IV SIX ITEM EXAMPLE

This appendix consists of excerpts from nine spreadsheets that analyze the six item example summarized in Chapter IV. Explanations of the spreadsheets are found in Appendix A. The appendix includes only the pages of the spreadsheets that are relevant to the stocking decision.

The first six spreadsheets are "Type 1" spreadsheets for each of the six line items. The seventh is a "Type 2" spreadsheet that consolidates the six "Type 1" spreadsheets. The eighth is a "Type 3" spreadsheet that provides an sequential stocking list for this example. The ninth spreadsheet is a summary of the stocking decision determined by the current Pacific and Atlantic Fleet methods.

On the "type 3" spreadsheet, two rows are highlighted to show stocking decisions. The first is the comparison with the Pacific Fleet method and the second is a comparison with the Atlantic Fleet method.

Oven Roast							
# of pallet levels	Potential Stocking levels	Ln of Stock Levels	Est Cum Distributio Function	Est Prob Distributio Function	Evaluation Stocking Level	Evaluation Ratio	
1	1750	7.4674			1750		
2	3500	8.1605	0.00%	0.0000000	3500	0.0328407	
3	5250	8.5660	0.00%	0.0000000	5250	0.0328265	
4	7000	8.8537	0.00%	0.0000001	7000	0.0325472	
5	8750	9.0768	0.00%	0.0000020	8750	0.0315260	
6	10500	9.2591	0.00%	0.0000200	10500	0.0296943	
7	12250	9.4133	0.01%	0.0001095	12250	0.0273321	
8	14000	9.5468	0.05%	0.0004028	14000	0.0247539	
9	15750	9.6646	0.16%	0.0011122	15750	0.0221831	
10	17500	9.7700	0.41%	0.0024836	17500	0.0197485	
11	19250	9.8653	0.88%	0.0047181	19250	0.0175115	
12	21000	9.9523	1.68%	0.0079024	21000	0.0154932	
13	22750	10.0323	2.87%	0.0119771	22750	0.0136918	
14	24500	10.1064	4.55%	0.0167473	24500	0.0120944	
15	26250	10.1754	6.74%	0.0219249	26250	0.0106829	
16	28000	10.2400	9.46%	0.0271815	28000	0.0094380	
17	29750	10.3006	12.68%	0.0321995	29750	0.0083408	
18	31500	10.3577	16.35%	0.0367087	31500	0.0073738	
19	33250	10.4118	20.40%	0.0405077	33250	0.0065212	
20	35000	10.4631	24.75%	0.0434711	35000	0.0057689	
21	36750	10.5119	29.30%	0.0455454	36750	0.0051047	
22	38500	10.5584	33.98%	0.0467382	38500	0.0045178	
23	40250	10.6029	38.69%	0.0471037	40250	0.0039987	
24	42000	10.6454	43.36%	0.0467292	42000	0.0035394	Pacific
25	43750	10.6862	47.93%	0.0457210	43750	0.0031327	
26	45500	10.7255	52.35%	0.0441936	45500	0.0027724	
27	47250	10.7632	56.58%	0.0422603	47250	0.0024531	
28	49000	10.7996	60.58%	0.0400292	49000	0.0021700	Atlantic
29	50750	10.8347	64.34%	0.0375973	50750	0.0019191	
30	52500	10.8686	67.84%	0.0350490	52500	0.0016966	
31	54250	10.9014	71.09%	0.0324555	54250	0.0014993	
32	56000	10.9331	74.08%	0.0298749	56000	0.0013245	Algorithm-
33	57750	10.9639	76.81%	0.0273531	57750	0.0011695	Pacific
34	59500	10.9937	79.30%	0.0249248	59500	0.0010322	
35	61250	11.0227	81.57%	0.0226150	61250	0.0009105	
36	63000	11.0509	83.61%	0.0204406	63000	0.0008029	Algorithm-
37	64750	11.0783	85.45%	0.0184117	64750	0.0007076	Atlantic
38	66500	11.1050	87.10%	0.0165331	66500	0.0006233	
39	68250	11.1309	88.58%	0.0148050	68250	0.0005489	
40	70000	11.1563	89.91%	0.0132245	70000	0.0004831	
41	71750	11.1809	91.09%	0.0117864	71750	0.0004250	
42	73500	11.2050	92.13%	0.0104836	73500	0.0003737	
43	75250	11.2286	93.07%	0.0093081	75250	0.0003285	

Pork Chops							
# of pallets levels	Potential Stocking levels	Ln of Stock Levels	Est Cum Distributio Function	Est Prob Distributio Function	Evaluation Stocking Level	Evaluation Ratio	
1	1500	7.3132	0.00%	0.0000001	1500	0.0266667	
2	3000	8.0064	0.01%	0.0000697	3000	0.0266115	
3	4500	8.4118	0.12%	0.0011307	4500	0.0251162	
4	6000	8.6995	0.64%	0.0052438	6000	0.0216990	
5	7500	8.9227	1.96%	0.0131976	7500	0.0179176	
6	9000	9.1050	4.33%	0.0236745	9000	0.0145746	
7	10500	9.2591	7.79%	0.0345749	10500	0.0118370	
8	12000	9.3927	12.21%	0.0441796	12000	0.0096511	
9	13500	9.5104	17.36%	0.0515294	13500	0.0079154	
10	15000	9.6158	22.99%	0.0563336	15000	0.0065333	
11	16500	9.7111	28.87%	0.0587389	16500	0.0054261	
12	18000	9.7981	**34.78%**	0.0591160	18000	0.0045327	**Pacific**
13	19500	9.8782	40.57%	0.0579110	19500	0.0038065	
14	21000	9.9523	46.13%	0.0555583	21000	0.0032120	
15	22500	10.0213	51.37%	0.0524370	22500	0.0027221	
16	24000	10.0858	56.26%	0.0488552	24000	0.0023159	
17	25500	10.1464	**60.76%**	0.0450522	25500	0.0019773	**Atlantic**
18	27000	10.2036	64.88%	0.0412046	27000	0.0016936	
19	28500	10.2577	68.62%	0.0374370	28500	0.0014548	
20	30000	10.3090	**72.01%**	0.0338331	30000	0.0012529	**Algorithm-**
21	31500	10.3577	75.05%	0.0304454	31500	0.0010817	**Pacific**
22	33000	10.4043	77.78%	0.0273027	33000	0.0009360	
23	34500	10.4487	80.22%	0.0244171	34500	0.0008116	
24	36000	10.4913	**82.40%**	0.0217889	36000	0.0007051	**Algorithm-**
25	37500	10.5321	84.34%	0.0194102	37500	0.0006137	**Atlantic**
26	39000	10.5713	86.07%	0.0172684	39000	0.0005350	
27	40500	10.6091	87.61%	0.0153476	40500	0.0004672	
28	42000	10.6454	88.97%	0.0136305	42000	0.0004085	
29	43500	10.6805	90.18%	0.0120997	43500	0.0003578	
30	45000	10.7144	91.25%	0.0107375	45000	0.0003138	
31	46500	10.7472	92.21%	0.0095275	46500	0.0002755	
32	48000	10.7790	93.05%	0.0084538	48000	0.0002423	
33	49500	10.8097	93.80%	0.0075021	49500	0.0002133	
34	51000	10.8396	94.47%	0.0066590	51000	0.0001880	
35	52500	10.8686	95.06%	0.0059125	52500	0.0001659	
36	54000	10.8967	95.58%	0.0052517	54000	0.0001465	
37	55500	10.9241	96.05%	0.0046668	55500	0.0001296	
38	57000	10.9508	96.46%	0.0041491	57000	0.0001147	
39	58500	10.9768	96.83%	0.0036908	58500	0.0001016	
40	60000	11.0021	97.16%	0.0032851	60000	0.0000902	
41	61500	11.0268	97.45%	0.0029257	61500	0.0000801	
42	63000	11.0509	97.72%	0.0026073	63000	0.0000712	
43	64500	11.0744	97.95%	0.0023250	64500	0.0000633	

Bacon							
# of pallets levels	Potential Stocking levels	Ln of Stock Levels	Est Cum Distributio Function	Est Prob Distributio Function	Evaluation Stocking Level	Evaluation Ratio	
1	1575	7.3620	0.00%	0.0000019	1575	0.0259740	
2	3150	8.0552	0.01%	0.0000858	3150	0.0254231	
3	4725	8.4606	0.06%	0.0005087	4725	0.0221555	
4	6300	8.7483	0.20%	0.0014066	6300	0.0182409	
5	7875	8.9714	0.47%	0.0027105	7875	0.0149364	
6	9450	9.1538	0.90%	0.0042736	9450	0.0123515	
7	11025	9.3079	1.49%	0.0059533	11025	0.0103499	
8	12600	9.4415	2.26%	0.0076377	12600	0.0087864	
9	14175	9.5592	3.18%	0.0092489	14175	0.0075480	
10	15750	9.6646	4.26%	0.0107379	15750	0.0065525	
11	17325	9.7599	5.46%	0.0120771	17325	0.0057409	
12	18900	9.8469	6.79%	0.0132545	18900	0.0050706	
13	20475	9.9270	8.22%	0.0142683	20475	0.0045105	
14	22050	10.0011	9.73%	0.0151235	22050	0.0040377	
15	23625	10.0701	11.31%	0.0158293	23625	0.0036347	
16	25200	10.1346	12.95%	0.0163969	25200	0.0032884	
17	26775	10.1952	14.64%	0.0168388	26775	0.0029885	
18	28350	10.2524	16.35%	0.0171678	28350	0.0027270	
19	29925	10.3064	18.09%	0.0173961	29925	0.0024975	
20	31500	10.3577	19.85%	0.0175354	31500	0.0022951	
21	33075	10.4065	21.60%	0.0175967	33075	0.0021155	
22	34650	10.4531	23.36%	0.0175901	34650	0.0019555	
23	36225	10.4975	25.12%	0.0175246	36225	0.0018123	
24	37800	10.5401	26.86%	0.0174085	37800	0.0016836	
25	39375	10.5809	**28.58%**	0.0172491	39375	0.0015675	**Pacific**
26	40950	10.6201	30.29%	0.0170531	40950	0.0014624	
27	42525	10.6578	31.97%	0.0168262	42525	0.0013670	
28	44100	10.6942	33.63%	0.0165736	44100	0.0012802	
29	45675	10.7293	**35.26%**	0.0162999	45675	0.0012008	**Algorithm-**
30	47250	10.7632	36.86%	0.0160090	47250	0.0011282	**Pacific**
31	48825	10.7960	38.43%	0.0157045	48825	0.0010615	
32	50400	10.8277	39.97%	0.0153893	50400	0.0010001	
33	51975	10.8585	41.47%	0.0150662	51975	0.0009435	
34	53550	10.8884	42.95%	0.0147375	53550	0.0008913	
35	55125	10.9174	44.39%	0.0144051	55125	0.0008429	
36	56700	10.9455	45.80%	0.0140709	56700	0.0007981	
37	58275	10.9729	47.17%	0.0137362	58275	0.0007564	
38	59850	10.9996	48.51%	0.0134024	59850	0.0007176	
39	61425	11.0256	49.82%	0.0130707	61425	0.0006815	
40	63000	11.0509	**51.09%**	0.0127418	63000	0.0006478	**Algorithm-**
41	64575	11.0756	52.33%	0.0124165	64575	0.0006163	**Atlantic**
42	66150	11.0997	53.54%	0.0120955	66150	0.0005868	
43	67725	11.1232	54.72%	0.0117795	67725	0.0005591	

Bacon # of pallets levels	Potential Stocking levels	Ln of Stock Levels	Est Cum Distributio Function	Est Prob Distributio Function	Evaluation Stocking Level	Evaluation Ratio	
44	69300	11.1462	55.87%	0.0114687	69300	0.0005332	
45	70875	11.1687	56.98%	0.0111637	70875	0.0005089	
46	72450	11.1907	58.07%	0.0108647	72450	0.0004860	
47	74025	11.2122	59.13%	0.0105718	74025	0.0004644	
48	75600	11.2332	60.16%	0.0102854	75600	0.0004441	
49	77175	11.2538	61.16%	0.0100054	77175	0.0004249	
50	78750	11.2740	62.13%	0.0097320	78750	0.0004069	
51	80325	11.2938	63.08%	0.0094653	80325	0.0003898	
52	81900	11.3133	64.00%	0.0092052	81900	0.0003736	
53	83475	11.3323	64.89%	0.0089517	83475	0.0003583	
54	85050	11.3510	65.76%	0.0087048	85050	0.0003438	Atlantic
55	86625	11.3693	66.61%	0.0084644	86625	0.0003301	
56	88200	11.3874	67.43%	0.0082305	88200	0.0003170	
57	89775	11.4051	68.23%	0.0080030	89775	0.0003047	
58	91350	11.4225	69.01%	0.0077817	91350	0.0002929	
59	92925	11.4395	69.77%	0.0075666	92925	0.0002817	
60	94500	11.4564	70.50%	0.0073575	94500	0.0002711	
61	96075	11.4729	71.22%	0.0071544	96075	0.0002609	
62	97650	11.4891	71.91%	0.0069570	97650	0.0002513	
63	99225	11.5051	72.59%	0.0067654	99225	0.0002421	
64	100800	11.5209	73.25%	0.0065792	100800	0.0002333	
65	102375	11.5364	73.89%	0.0063985	102375	0.0002249	
66	103950	11.5517	74.51%	0.0062230	103950	0.0002169	
67	105525	11.5667	75.12%	0.0060527	105525	0.0002093	
68	107100	11.5815	75.70%	0.0058874	107100	0.0002020	
69	108675	11.5961	76.28%	0.0057269	108675	0.0001950	
70	110250	11.6105	76.83%	0.0055712	110250	0.0001883	
71	111825	11.6247	77.38%	0.0054200	111825	0.0001819	
72	113400	11.6387	77.90%	0.0052734	113400	0.0001758	
73	114975	11.6525	78.42%	0.0051310	114975	0.0001700	
74	116550	11.6661	78.92%	0.0049929	116550	0.0001643	
75	118125	11.6795	79.40%	0.0048589	118125	0.0001589	
76	119700	11.6927	79.87%	0.0047288	119700	0.0001538	
77	121275	11.7058	80.33%	0.0046026	121275	0.0001488	
78	122850	11.7187	80.78%	0.0044801	122850	0.0001440	
79	124425	11.7315	81.22%	0.0043612	124425	0.0001395	
80	126000	11.7440	81.64%	0.0042459	126000	0.0001351	
81	127575	11.7565	82.06%	0.0041339	127575	0.0001309	
82	129150	11.7687	82.46%	0.0040252	129150	0.0001268	
83	130725	11.7809	82.85%	0.0039198	130725	0.0001229	
84	132300	11.7928	83.23%	0.0038174	132300	0.0001191	
85	133875	11.8047	83.60%	0.0037180	133875	0.0001155	
86	135450	11.8164	83.97%	0.0036216	135450	0.0001120	
87	137025	11.8279	84.32%	0.0035279	137025	0.0001087	

Frankfurters							
# of pallets levels	Potential Stocking levels	Ln of Stock Levels	Est Cum Distributio Function	Est Prob Distributio Function	Evaluation Stocking Level	Evaluation Ratio	
1	1200	7.0901	0.00%	0.0000000	1200	0.0294985	
2	2400	7.7832	0.00%	0.0000000	2400	0.0294979	
3	3600	8.1887	0.00%	0.0000012	3600	0.0293174	
4	4800	8.4764	0.00%	0.0000249	4800	0.0281534	
5	6000	8.6995	0.02%	0.0001863	6000	0.0258785	
6	7200	8.8818	0.10%	0.0007621	7200	0.0230688	
7	8400	9.0360	0.31%	0.0021212	8400	0.0202124	
8	9600	9.1695	0.76%	0.0045531	9600	0.0175597	
9	10800	9.2873	1.58%	0.0081344	10800	0.0152031	
10	12000	9.3927	2.85%	0.0127042	12000	0.0131551	
11	13200	9.4880	4.64%	0.0179281	13200	0.0113939	
12	14400	9.5750	6.98%	0.0233955	14400	0.0098857	
13	15600	9.6550	9.85%	0.0287065	15600	0.0085954	
14	16800	9.7291	13.20%	0.0335296	16800	0.0074903	
15	18000	9.7981	16.97%	0.0376284	18000	0.0065418	
16	19200	9.8627	21.05%	0.0408656	19200	0.0057256	
17	20400	9.9233	25.37%	0.0431904	20400	0.0050213	
18	21600	9.9804	29.84%	0.0446207	21600	0.0044117	
19	22800	10.0345	34.36%	0.0452227	22800	0.0038827	
20	24000	10.0858	38.87%	0.0450931	24000	0.0034224	
21	25200	10.1346	43.30%	0.0443437	25200	0.0030209	
22	26400	10.1811	47.61%	0.0430903	26400	0.0026698	
23	27600	10.2256	51.75%	0.0414449	27600	0.0023622	
24	28800	10.2681	55.71%	0.0395095	28800	0.0020922	
25	30000	10.3090	**59.44%**	0.0373752	30000	0.0018547	**Atlantic &**
26	31200	10.3482	62.96%	0.0351197	31200	0.0016456	**Pacific**
27	32400	10.3859	66.24%	0.0328075	32400	0.0014611	
28	33600	10.4223	**69.28%**	0.0304908	33600	0.0012982	**Algorithm-**
29	34800	10.4574	72.11%	0.0282107	34800	0.0011541	**Pacific**
30	36000	10.4913	74.71%	0.0259984	36000	0.0010266	
31	37200	10.5241	77.09%	0.0238769	37200	0.0009136	
32	38400	10.5558	79.28%	0.0218618	38400	0.0008134	
33	39600	10.5866	**81.28%**	0.0199634	39600	0.0007246	**Algorithm-**
34	40800	10.6164	83.09%	0.0181871	40800	0.0006456	**Atlantic**
35	42000	10.6454	84.75%	0.0165347	42000	0.0005755	
36	43200	10.6736	86.25%	0.0150052	43200	0.0005132	
37	44400	10.7010	87.61%	0.0135957	44400	0.0004578	
38	45600	10.7277	88.84%	0.0123015	45600	0.0004085	
39	46800	10.7536	89.95%	0.0111171	46800	0.0003646	
40	48000	10.7790	90.95%	0.0100362	48000	0.0003255	
41	49200	10.8036	91.86%	0.0090522	49200	0.0002907	
42	50400	10.8277	92.67%	0.0081584	50400	0.0002597	
43	51600	10.8513	93.41%	0.0073479	51600	0.0002320	

Ground Beef							
# of pallets levels	Potential Stocking levels	Ln of Stock Levels	Est Cum Distributio Function	Est Prob Distributio Function	Evaluation Stocking Level	Evaluation Ratio	
1	1650	7.4085	0.00%	0.0000000	1650	0.0284900	
2	3300	8.1017	0.00%	0.0000000	3300	0.0284895	
3	4950	8.5071	0.00%	0.0000000	4950	0.0283560	
4	6600	8.7948	0.00%	0.0000000	6600	0.0275418	
5	8250	9.0180	0.00%	0.0000004	8250	0.0259363	
6	9900	9.2003	0.00%	0.0000022	9900	0.0238923	
7	11550	9.3544	0.00%	0.0000084	11550	0.0217379	
8	13200	9.4880	0.00%	0.0000246	13200	0.0196617	
9	14850	9.6058	0.01%	0.0000588	14850	0.0177490	
10	16500	9.7111	0.02%	0.0001214	16500	0.0160273	
11	18150	9.8064	0.04%	0.0002235	18150	0.0144953	
12	19800	9.8934	0.08%	0.0003761	19800	0.0131391	
13	21450	9.9735	0.14%	0.0005883	21450	0.0119405	
14	23100	10.0476	0.23%	0.0008674	23100	0.0108806	
15	24750	10.1166	0.35%	0.0012173	24750	0.0099415	
16	26400	10.1811	0.51%	0.0016391	26400	0.0091075	
17	28050	10.2417	0.73%	0.0021312	28050	0.0083647	
18	29700	10.2989	0.99%	0.0026889	29700	0.0077011	
19	31350	10.3530	1.33%	0.0033058	31350	0.0071064	
20	33000	10.4043	1.72%	0.0039738	33000	0.0065718	
21	34650	10.4531	2.19%	0.0046834	34650	0.0060898	
22	36300	10.4996	2.73%	0.0054249	36300	0.0056540	
23	37950	10.5440	3.35%	0.0061879	37950	0.0052588	
24	39600	10.5866	4.05%	0.0069625	39600	0.0048995	
25	41250	10.6274	4.82%	0.0077391	41250	0.0045721	
26	42900	10.6666	5.67%	0.0085088	42900	0.0042729	
27	44550	10.7044	6.60%	0.0092635	44550	0.0039989	
28	46200	10.7407	7.60%	0.0099958	46200	0.0037474	
29	47850	10.7758	8.67%	0.0106994	47850	0.0035162	
30	49500	10.8097	9.81%	0.0113691	49500	0.0033031	
31	51150	10.8425	11.01%	0.0120005	51150	0.0031064	
32	52800	10.8743	12.27%	0.0125900	52800	0.0029244	
33	54450	10.9050	13.58%	0.0131350	54450	0.0027559	
34	56100	10.9349	14.94%	0.0136336	56100	0.0025995	
35	57750	10.9639	16.35%	0.0140848	57750	0.0024542	
36	59400	10.9920	17.80%	0.0144880	59400	0.0023190	
37	61050	11.0194	19.28%	0.0148432	61050	0.0021930	
38	62700	11.0461	20.80%	0.0151509	62700	0.0020754	
39	64350	11.0721	22.34%	0.0154122	64350	0.0019655	
40	66000	11.0974	23.90%	0.0156283	66000	0.0018628	
41	67650	11.1221	25.48%	0.0158007	67650	0.0017665	
42	69300	11.1462	27.08%	0.0159313	69300	0.0016763	
43	70950	11.1697	28.68%	0.0160220	70950	0.0015917	

Ground Beef							
# of pallets levels	Potential Stocking levels	Ln of Stock Levels	Est Cum Distributio Function	Est Prob Distributio Function	Evaluation Stocking Level	Evaluation Ratio	
44	72600	11.1927	30.29%	0.0160748	72600	0.0015122	
45	74250	11.2152	31.89%	0.0160920	74250	0.0014374	
46	75900	11.2372	33.50%	0.0160758	75900	0.0013671	
47	77550	11.2587	35.11%	0.0160285	77550	0.0013008	
48	79200	11.2797	36.70%	0.0159522	79200	0.0012383	
49	80850	11.3004	38.29%	0.0158493	80850	0.0011794	Algorithm-
50	82500	11.3206	39.86%	0.0157219	82500	0.0011238	Pacific
51	84150	11.3404	41.41%	0.0155722	84150	0.0010712	
52	85800	11.3598	42.96%	0.0154021	85800	0.0010215	
53	87450	11.3788	44.48%	0.0152138	87450	0.0009745	
54	89100	11.3975	45.98%	0.0150091	89100	0.0009300	Pacific
55	90750	11.4159	47.46%	0.0147898	90750	0.0008879	
56	92400	11.4339	48.91%	0.0145577	92400	0.0008479	
57	94050	11.4516	50.34%	0.0143143	94050	0.0008101	
58	95700	11.4690	51.75%	0.0140611	95700	0.0007741	
59	97350	11.4861	53.13%	0.0137996	97350	0.0007400	
60	99000	11.5029	54.48%	0.0135312	99000	0.0007076	
61	100650	11.5194	55.81%	0.0132571	100650	0.0006768	Algorithm-
62	102300	11.5357	57.11%	0.0129784	102300	0.0006475	Atlantic
63	103950	11.5517	58.38%	0.0126962	103950	0.0006196	
64	105600	11.5674	59.62%	0.0124116	105600	0.0005931	Atlantic
65	107250	11.5829	60.83%	0.0121253	107250	0.0005679	
66	108900	11.5982	62.01%	0.0118383	108900	0.0005439	
67	110550	11.6132	63.17%	0.0115513	110550	0.0005210	
68	112200	11.6280	64.30%	0.0112650	112200	0.0004992	
69	113850	11.6426	65.39%	0.0109800	113850	0.0004784	
70	115500	11.6570	66.46%	0.0106969	115500	0.0004585	
71	117150	11.6712	67.50%	0.0104162	117150	0.0004396	
72	118800	11.6852	68.52%	0.0101383	118800	0.0004216	
73	120450	11.6990	69.50%	0.0098636	120450	0.0004043	
74	122100	11.7126	70.46%	0.0095926	122100	0.0003878	
75	123750	11.7260	71.40%	0.0093254	123750	0.0003721	
76	125400	11.7393	72.30%	0.0090624	125400	0.0003571	
77	127050	11.7523	73.18%	0.0088039	127050	0.0003427	
78	128700	11.7652	74.04%	0.0085500	128700	0.0003290	
79	130350	11.7780	74.87%	0.0083008	130350	0.0003159	
80	132000	11.7906	75.67%	0.0080566	132000	0.0003033	
81	133650	11.8030	76.46%	0.0078175	133650	0.0002913	
82	135300	11.8152	77.21%	0.0075835	135300	0.0002798	
83	136950	11.8274	77.95%	0.0073547	136950	0.0002688	
84	138600	11.8393	78.66%	0.0071311	138600	0.0002583	
85	140250	11.8512	79.35%	0.0069129	140250	0.0002482	
86	141900	11.8629	80.02%	0.0066999	141900	0.0002385	
87	143550	11.8744	80.67%	0.0064922	143550	0.0002293	

Chicken						
# of pallets levels	Potential Stocking levels	Ln of Stock Levels	Est Cum Distributio Function	Est Prob Distributio Function	Evaluation Stocking Level	Evaluation Ratio
1	1400	7.2442			1400	
2	2800	7.9374			2800	
3	4200	8.3428	0.00%	0.0000000	4200	0.0300752
4	5600	8.6305	0.00%	0.0000000	5600	0.0299430
5	7000	8.8537	0.00%	0.0000000	7000	0.0294569
6	8400	9.0360	0.00%	0.0000000	8400	0.0285073
7	9800	9.1901	0.00%	0.0000000	9800	0.0271885
8	11200	9.3237	0.00%	0.0000000	11200	0.0256500
9	12600	9.4415	0.00%	0.0000001	12600	0.0240212
10	14000	9.5468	0.00%	0.0000003	14000	0.0223923
11	15400	9.6421	0.00%	0.0000009	15400	0.0208188
12	16800	9.7291	0.00%	0.0000023	16800	0.0193310
13	18200	9.8092	0.00%	0.0000052	18200	0.0179434
14	19600	9.8833	0.00%	0.0000109	19600	0.0166600
15	21000	9.9523	0.00%	0.0000209	21000	0.0154790
16	22400	10.0168	0.01%	0.0000372	22400	0.0143956
17	23800	10.0774	0.01%	0.0000625	23800	0.0134030
18	25200	10.1346	0.02%	0.0000997	25200	0.0124942
19	26600	10.1887	0.04%	0.0001521	26600	0.0116618
20	28000	10.2400	0.06%	0.0002229	28000	0.0108988
21	29400	10.2887	0.09%	0.0003156	29400	0.0101989
22	30800	10.3353	0.14%	0.0004334	30800	0.0095559
23	32200	10.3797	0.19%	0.0005792	32200	0.0089644
24	33600	10.4223	0.27%	0.0007555	33600	0.0084195
25	35000	10.4631	0.37%	0.0009642	35000	0.0079169
26	36400	10.5023	0.49%	0.0012066	36400	0.0074524
27	37800	10.5401	0.64%	0.0014834	37800	0.0070226
28	39200	10.5764	0.81%	0.0017945	39200	0.0066243
29	40600	10.6115	1.03%	0.0021392	40600	0.0062546
30	42000	10.6454	1.28%	0.0025162	42000	0.0059110
31	43400	10.6782	1.57%	0.0029236	43400	0.0055912
32	44800	10.7100	1.91%	0.0033589	44800	0.0052931
33	46200	10.7407	2.29%	0.0038193	46200	0.0050150
34	47600	10.7706	2.72%	0.0043014	47600	0.0047551
35	49000	10.7996	3.20%	0.0048019	49000	0.0045119
36	50400	10.8277	3.73%	0.0053169	50400	0.0042842
37	51800	10.8551	4.32%	0.0058426	51800	0.0040706
38	53200	10.8818	4.95%	0.0063753	53200	0.0038702
39	54600	10.9078	5.65%	0.0069111	54600	0.0036818
40	56000	10.9331	6.39%	0.0074462	56000	0.0035046
41	57400	10.9578	7.19%	0.0079771	57400	0.0033378
42	58800	10.9819	8.04%	0.0085003	58800	0.0031806
43	60200	11.0054	8.94%	0.0090126	60200	0.0030323

Chicken							
# of pallets levels	Potential Stocking levels	Ln of Stock Levels	Est Cum Distributio Function	Est Prob Distributio Function	Evaluation Stocking Level	Evaluation Ratio	
44	61600	11.0284	9.89%	0.0095112	61600	0.0028923	
45	63000	11.0509	10.89%	0.0099932	63000	0.0027600	
46	64400	11.0729	11.94%	0.0104564	64400	0.0026349	
47	65800	11.0944	13.02%	0.0108986	65800	0.0025165	
48	67200	11.1154	14.16%	0.0113180	67200	0.0024044	
49	68600	11.1360	15.33%	0.0117130	68600	0.0022982	
50	70000	11.1563	16.54%	0.0120824	70000	0.0021975	
51	71400	11.1761	17.78%	0.0124251	71400	0.0021019	
52	72800	11.1955	19.05%	0.0127404	72800	0.0020111	
53	74200	11.2145	20.36%	0.0130278	74200	0.0019249	
54	75600	11.2332	21.68%	0.0132871	75600	0.0018429	
55	77000	11.2516	23.04%	0.0135181	77000	0.0017649	
56	78400	11.2696	24.41%	0.0137209	78400	0.0016907	
57	79800	11.2873	25.80%	0.0138959	79800	0.0016200	
58	81200	11.3047	27.20%	0.0140435	81200	0.0015527	
59	82600	11.3218	28.62%	0.0141642	82600	0.0014885	
60	84000	11.3386	30.04%	0.0142587	84000	0.0014273	
61	85400	11.3551	31.48%	0.0143278	85400	0.0013690	
62	86800	11.3714	32.91%	0.0143724	86800	0.0013133	Algorithm-
63	88200	11.3874	34.35%	0.0143935	88200	0.0012601	Pacific
64	89600	11.4031	35.79%	0.0143920	89600	0.0012093	
65	91000	11.4186	37.23%	0.0143691	91000	0.0011608	
66	92400	11.4339	38.66%	0.0143257	92400	0.0011144	
67	93800	11.4489	40.09%	0.0142631	93800	0.0010700	
68	95200	11.4637	41.51%	0.0141823	95200	0.0010276	
69	96600	11.4783	42.92%	0.0140844	96600	0.0009870	
70	98000	11.4927	44.31%	0.0139707	98000	0.0009482	
71	99400	11.5069	45.70%	0.0138422	99400	0.0009110	
72	100800	11.5209	47.07%	0.0137000	100800	0.0008754	
73	102200	11.5347	48.42%	0.0135452	102200	0.0008413	
74	103600	11.5483	49.76%	0.0133789	103600	0.0008086	
75	105000	11.5617	51.08%	0.0132020	105000	0.0007773	
76	106400	11.5750	52.38%	0.0130156	106400	0.0007473	
77	107800	11.5880	53.66%	0.0128206	107800	0.0007185	Algorithm-
78	109200	11.6009	54.92%	0.0126180	109200	0.0006909	Atlantic
79	110600	11.6137	56.17%	0.0124087	110600	0.0006645	
80	112000	11.6263	57.38%	0.0121935	112000	0.0006391	
81	113400	11.6387	58.58%	0.0119731	113400	0.0006147	Pacific &
82	114800	11.6509	59.76%	0.0117485	114800	0.0005913	Atlantic
83	116200	11.6631	60.91%	0.0115202	116200	0.0005688	
84	117600	11.6750	62.04%	0.0112890	117600	0.0005473	
85	119000	11.6869	63.14%	0.0110556	119000	0.0005266	
86	120400	11.6986	64.23%	0.0108204	120400	0.0005067	
87	121800	11.7101	65.28%	0.0105842	121800	0.0004876	

Pri	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
					30.45		**37.50**		**38.50**		**33.90**		**35.10**		**33.25**	
1	Oven Roast	3500	0.03284	1	30.45											30.45
2	Oven Roast	5250	0.03283	2	60.90											60.90
3	Oven Roast	7000	0.03255	3	91.35											91.35
4	Oven Roast	8750	0.03153	4	121.80											121.80
5	Chicken	4200	0.03008	4	121.80									1	33.25	155.05
6	Chicken	5600	0.02994	4	121.80									2	66.50	188.30
7	Oven Roast	10500	0.02969	5	152.25									2	66.50	218.75
8	Frankfurters	1200	0.02950	5	152.25					1	33.90			2	66.50	252.65
9	Frankfurters	2400	0.02950	5	152.25					2	67.80			2	66.50	286.55
10	Chicken	7000	0.02946	5	152.25					2	67.80			3	99.75	319.80
11	Frankfurters	3600	0.02932	5	152.25					3	101.70			3	99.75	353.70
12	Chicken	8400	0.02851	5	152.25					3	101.70			4	133.00	386.95
13	Ground Beef	1650	0.02849	5	152.25					3	101.70	1	35.10	4	133.00	422.05
14	Ground Beef	3300	0.02849	5	152.25					3	101.70	2	70.20	4	133.00	457.15
15	Ground Beef	4950	0.02836	5	152.25					3	101.70	3	105.30	4	133.00	492.25
16	Frankfurters	4800	0.02815	5	152.25					4	135.60	3	105.30	4	133.00	526.15
17	Ground Beef	6600	0.02754	5	152.25					4	135.60	4	140.40	4	133.00	561.25
18	Oven Roast	12250	0.02733	6	182.70					4	135.60	4	140.40	4	133.00	591.70
19	Chicken	9800	0.02719	6	182.70					4	135.60	4	140.40	5	166.25	624.95
20	Pork chops	1500	0.02667	6	182.70	1	37.50			4	135.60	4	140.40	5	166.25	662.45
21	Pork chops	3000	0.02661	6	182.70	2	75.00			4	135.60	4	140.40	5	166.25	699.95
22	Bacon	1575	0.02597	6	182.70	2	75.00	1	38.50	4	135.60	4	140.40	5	166.25	738.45
23	Ground Beef	8250	0.02594	6	182.70	2	75.00	1	38.50	4	135.60	5	175.50	5	166.25	773.55
24	Frankfurters	6000	0.02588	6	182.70	2	75.00	1	38.50	5	169.50	5	175.50	5	166.25	807.45
25	Chicken	11200	0.02565	6	182.70	2	75.00	1	38.50	5	169.50	5	175.50	6	199.50	840.70
26	Bacon	3150	0.02542	6	182.70	2	75.00	2	77.00	5	169.50	5	175.50	6	199.50	879.20
27	Pork chops	4500	0.02512	6	182.70	3	112.50	2	77.00	5	169.50	5	175.50	6	199.50	916.70
28	Oven Roast	14000	0.02475	7	213.15	3	112.50	2	77.00	5	169.50	5	175.50	6	199.50	947.15
29	Chicken	12600	0.02402	7	213.15	3	112.50	2	77.00	5	169.50	5	175.50	7	232.75	980.40
30	Ground Beef	9900	0.02389	7	213.15	3	112.50	2	77.00	5	169.50	6	210.60	7	232.75	1015.50
31	Frankfurters	7200	0.02307	7	213.15	3	112.50	2	77.00	6	203.40	6	210.60	7	232.75	1049.40
32	Chicken	14000	0.02239	7	213.15	3	112.50	2	77.00	6	203.40	6	210.60	8	266.00	1082.65
33	Oven Roast	15750	0.02218	8	243.60	3	112.50	2	77.00	6	203.40	6	210.60	8	266.00	1113.10

Pri	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
34	Bacon	4725	0.02216	8	243.60	3	112.50	3	115.50	6	203.40	6	210.60	8	266.00	1151.60
35	Ground Beef	11550	0.02174	8	243.60	3	112.50	3	115.50	6	203.40	7	245.70	8	266.00	1186.70
36	Pork chops	6000	0.02170	8	243.60	4	150.00	3	115.50	6	203.40	7	245.70	8	266.00	1224.20
37	Chicken	15400	0.02082	8	243.60	4	150.00	3	115.50	6	203.40	7	245.70	9	299.25	1257.45
38	Frankfurters	8400	0.02021	8	243.60	4	150.00	3	115.50	7	237.30	7	245.70	9	299.25	1291.35
39	Oven Roast	17500	0.01975	9	274.05	4	150.00	3	115.50	7	237.30	7	245.70	9	299.25	1321.80
40	Ground Beef	13200	0.01966	9	274.05	4	150.00	3	115.50	7	237.30	8	280.80	9	299.25	1356.90
41	Chicken	16800	0.01933	9	274.05	4	150.00	3	115.50	7	237.30	8	280.80	10	332.50	1390.15
42	Bacon	6300	0.01824	9	274.05	4	150.00	4	154.00	7	237.30	8	280.80	10	332.50	1428.65
43	Chicken	18200	0.01794	9	274.05	4	150.00	4	154.00	7	237.30	8	280.80	11	365.75	1461.90
44	Pork chops	7500	0.01792	9	274.05	5	187.50	4	154.00	7	237.30	8	280.80	11	365.75	1499.40
45	Ground Beef	14850	0.01775	9	274.05	5	187.50	4	154.00	7	237.30	9	315.90	11	365.75	1534.50
46	Frankfurters	9600	0.01756	9	274.05	5	187.50	4	154.00	8	271.20	9	315.90	11	365.75	1568.40
47	Oven Roast	19250	0.01751	10	304.50	5	187.50	4	154.00	8	271.20	9	315.90	11	365.75	1598.85
48	Chicken	19600	0.01666	10	304.50	5	187.50	4	154.00	8	271.20	9	315.90	12	399.00	1632.10
49	Ground Beef	16500	0.01603	10	304.50	5	187.50	4	154.00	8	271.20	10	351.00	12	399.00	1667.20
50	Oven Roast	21000	0.01549	11	334.95	5	187.50	4	154.00	8	271.20	10	351.00	12	399.00	1697.65
51	Chicken	21000	0.01548	11	334.95	5	187.50	4	154.00	8	271.20	10	351.00	13	432.25	1730.90
52	Frankfurters	10800	0.01520	11	334.95	5	187.50	4	154.00	9	305.10	10	351.00	13	432.25	1764.80
53	Bacon	7875	0.01494	11	334.95	5	187.50	5	192.50	9	305.10	10	351.00	13	432.25	1803.30
54	Pork chops	9000	0.01457	11	334.95	6	225.00	5	192.50	9	305.10	10	351.00	13	432.25	1840.80
55	Ground Beef	18150	0.01450	11	334.95	6	225.00	5	192.50	9	305.10	11	386.10	13	432.25	1875.90
56	Chicken	22400	0.01440	11	334.95	6	225.00	5	192.50	9	305.10	11	386.10	14	465.50	1909.15
57	Oven Roast	22750	0.01369	12	365.40	6	225.00	5	192.50	9	305.10	11	386.10	14	465.50	1939.60
58	Chicken	23800	0.01340	12	365.40	6	225.00	5	192.50	9	305.10	11	386.10	15	498.75	1972.85
59	Frankfurters	12000	0.01316	12	365.40	6	225.00	5	192.50	10	339.00	11	386.10	15	498.75	2006.75
60	Ground Beef	19800	0.01314	12	365.40	6	225.00	5	192.50	10	339.00	12	421.20	15	498.75	2041.85
61	Chicken	25200	0.01249	12	365.40	6	225.00	5	192.50	10	339.00	12	421.20	16	532.00	2075.10
62	Bacon	9450	0.01235	12	365.40	6	225.00	6	231.00	10	339.00	12	421.20	16	532.00	2113.60
63	Oven Roast	24500	0.01209	13	395.85	6	225.00	6	231.00	10	339.00	12	421.20	16	532.00	2144.05
64	Ground Beef	21450	0.01194	13	395.85	6	225.00	6	231.00	10	339.00	13	456.30	16	532.00	2179.15
65	Pork chops	10500	0.01184	13	395.85	7	262.50	6	231.00	10	339.00	13	456.30	16	532.00	2216.65
66	Chicken	26600	0.01166	13	395.85	7	262.50	6	231.00	10	339.00	13	456.30	17	565.25	2249.90
67	Frankfurters	13200	0.01139	13	395.85	7	262.50	6	231.00	11	372.90	13	456.30	17	565.25	2283.80
68	Chicken	28000	0.01090	13	395.85	7	262.50	6	231.00	11	372.90	13	456.30	18	598.50	2317.05
69	Ground Beef	23100	0.01088	13	395.85	7	262.50	6	231.00	11	372.90	14	491.40	18	598.50	2352.15
70	Oven Roast	26250	0.01068	14	426.30	7	262.50	6	231.00	11	372.90	14	491.40	18	598.50	2382.60

Pri	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
71	Bacon	11025	0.01035	14	426.30	7	262.50	7	269.50	11	372.90	14	491.40	18	598.50	2421.10
72	Chicken	29400	0.01020	14	426.30	7	262.50	7	269.50	11	372.90	14	491.40	19	631.75	2454.35
73	Ground Beef	24750	0.00994	14	426.30	7	262.50	7	269.50	11	372.90	15	526.50	19	631.75	2489.45
74	Frankfurters	14400	0.00989	14	426.30	7	262.50	7	269.50	12	406.80	15	526.50	19	631.75	2523.35
75	Pork chops	12000	0.00965	14	426.30	8	300.00	7	269.50	12	406.80	15	526.50	19	631.75	2560.85
76	Chicken	30800	0.00956	14	426.30	8	300.00	7	269.50	12	406.80	15	526.50	20	665.00	2594.10
77	Oven Roast	28000	0.00944	15	456.75	8	300.00	7	269.50	12	406.80	15	526.50	20	665.00	2624.55
78	Ground Beef	26400	0.00911	15	456.75	8	300.00	7	269.50	12	406.80	16	561.60	20	665.00	2659.65
79	Chicken	32200	0.00896	15	456.75	8	300.00	7	269.50	12	406.80	16	561.60	21	698.25	2692.90
80	Bacon	12600	0.00879	15	456.75	8	300.00	8	308.00	12	406.80	16	561.60	21	698.25	2731.40
81	Frankfurters	15600	0.00860	15	456.75	8	300.00	8	308.00	13	440.70	16	561.60	21	698.25	2765.30
82	Chicken	33600	0.00842	15	456.75	8	300.00	8	308.00	13	440.70	16	561.60	22	731.50	2798.55
83	Ground Beef	28050	0.00836	15	456.75	8	300.00	8	308.00	13	440.70	17	596.70	22	731.50	2833.65
84	Oven Roast	29750	0.00834	16	487.20	8	300.00	8	308.00	13	440.70	17	596.70	22	731.50	2864.10
85	Chicken	35000	0.00792	16	487.20	8	300.00	8	308.00	13	440.70	17	596.70	23	764.75	2897.35
86	Pork chops	13500	0.00792	16	487.20	9	337.50	8	308.00	13	440.70	17	596.70	23	764.75	2934.85
87	Ground Beef	29700	0.00770	16	487.20	9	337.50	8	308.00	13	440.70	18	631.80	23	764.75	2969.95
88	Bacon	14175	0.00755	16	487.20	9	337.50	9	346.50	13	440.70	18	631.80	23	764.75	3008.45
89	Frankfurters	16800	0.00749	16	487.20	9	337.50	9	346.50	14	474.60	18	631.80	23	764.75	3042.35
90	Chicken	36400	0.00745	16	487.20	9	337.50	9	346.50	14	474.60	18	631.80	24	798.00	3075.60
91	Oven Roast	31500	0.00737	17	517.65	9	337.50	9	346.50	14	474.60	18	631.80	24	798.00	3106.05
92	Ground Beef	31350	0.00711	17	517.65	9	337.50	9	346.50	14	474.60	19	666.90	24	798.00	3141.15
93	Chicken	37800	0.00702	17	517.65	9	337.50	9	346.50	14	474.60	19	666.90	25	831.25	3174.40
94	Chicken	39200	0.00662	17	517.65	9	337.50	9	346.50	14	474.60	19	666.90	26	864.50	3207.65
95	Ground Beef	33000	0.00657	17	517.65	9	337.50	9	346.50	14	474.60	20	702.00	26	864.50	3242.75
96	Bacon	15750	0.00655	17	517.65	9	337.50	10	385.00	14	474.60	20	702.00	26	864.50	3281.25
97	Frankfurters	18000	0.00654	17	517.65	9	337.50	10	385.00	15	508.50	20	702.00	26	864.50	3315.15
98	Pork chops	15000	0.00653	17	517.65	10	375.00	10	385.00	15	508.50	20	702.00	26	864.50	3352.65
99	Oven Roast	33250	0.00652	18	548.10	10	375.00	10	385.00	15	508.50	20	702.00	26	864.50	3383.10
100	Chicken	40600	0.00625	18	548.10	10	375.00	10	385.00	15	508.50	20	702.00	27	897.75	3416.35
101	Ground Beef	34650	0.00609	18	548.10	10	375.00	10	385.00	15	508.50	21	737.10	27	897.75	3451.45
102	Chicken	42000	0.00591	18	548.10	10	375.00	10	385.00	15	508.50	21	737.10	28	931.00	3484.70
103	Oven Roast	35000	0.00577	19	578.55	10	375.00	10	385.00	15	508.50	21	737.10	28	931.00	3515.15
104	Bacon	17325	0.00574	19	578.55	10	375.00	11	423.50	15	508.50	21	737.10	28	931.00	3553.65
105	Frankfurters	19200	0.00573	19	578.55	10	375.00	11	423.50	16	542.40	21	737.10	28	931.00	3587.55
106	Ground Beef	36300	0.00565	19	578.55	10	375.00	11	423.50	16	542.40	22	772.20	28	931.00	3622.65
107	Chicken	43400	0.00559	19	578.55	10	375.00	11	423.50	16	542.40	22	772.20	29	964.25	3655.90

Pri	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
108	Pork chops	16500	0.00543	19	578.55	11	412.50	11	423.50	16	542.40	22	772.20	29	964.25	3693.40
109	Chicken	44800	0.00529	19	578.55	11	412.50	11	423.50	16	542.40	22	772.20	30	997.50	3726.65
110	Ground Beef	37950	0.00526	19	578.55	11	412.50	11	423.50	16	542.40	23	807.30	30	997.50	3761.75
111	Oven Roast	36750	0.00510	20	609.00	11	412.50	11	423.50	16	542.40	23	807.30	30	997.50	3792.20
112	Bacon	18900	0.00507	20	609.00	11	412.50	12	462.00	16	542.40	23	807.30	30	997.50	3830.70
113	Frankfurters	20400	0.00502	20	609.00	11	412.50	12	462.00	17	576.30	23	807.30	30	997.50	3864.60
114	Chicken	46200	0.00501	20	609.00	11	412.50	12	462.00	17	576.30	23	807.30	31	1030.75	3897.85
115	Ground Beef	39600	0.00490	20	609.00	11	412.50	12	462.00	17	576.30	24	842.40	31	1030.75	3932.95
116	Chicken	47600	0.00476	20	609.00	11	412.50	12	462.00	17	576.30	24	842.40	32	1064.00	3966.20
117	Ground Beef	41250	0.00457	20	609.00	11	412.50	12	462.00	17	576.30	25	877.50	32	1064.00	4001.30
118	Pork chops	18000	0.00453	20	609.00	12	450.00	12	462.00	17	576.30	25	877.50	32	1064.00	4038.80
119	Oven Roast	38500	0.00452	21	639.45	12	450.00	12	462.00	17	576.30	25	877.50	32	1064.00	4069.25
120	Chicken	49000	0.00451	21	639.45	12	450.00	12	462.00	17	576.30	25	877.50	33	1097.25	4102.50
121	Bacon	20475	0.00451	21	639.45	12	450.00	13	500.50	17	576.30	25	877.50	33	1097.25	4141.00
122	Frankfurters	21600	0.00441	21	639.45	12	450.00	13	500.50	18	610.20	25	877.50	33	1097.25	4174.90
123	Chicken	50400	0.00428	21	639.45	12	450.00	13	500.50	18	610.20	25	877.50	34	1130.50	4208.15
124	Ground Beef	42900	0.00427	21	639.45	12	450.00	13	500.50	18	610.20	26	912.60	34	1130.50	4243.25
125	Chicken	51800	0.00407	21	639.45	12	450.00	13	500.50	18	610.20	26	912.60	35	1163.75	4276.50
126	Bacon	22050	0.00404	21	639.45	12	450.00	14	539.00	18	610.20	26	912.60	35	1163.75	4315.00
127	Ground Beef	44550	0.00400	21	639.45	12	450.00	14	539.00	18	610.20	27	947.70	35	1163.75	4350.10
128	Oven Roast	40250	0.00400	22	669.90	12	450.00	14	539.00	18	610.20	27	947.70	35	1163.75	4380.55
129	Frankfurters	22800	0.00388	22	669.90	12	450.00	14	539.00	19	644.10	27	947.70	35	1163.75	4414.45
130	Chicken	53200	0.00387	22	669.90	12	450.00	14	539.00	19	644.10	27	947.70	36	1197.00	4447.70
131	Pork chops	19500	0.00381	22	669.90	13	487.50	14	539.00	19	644.10	27	947.70	36	1197.00	4485.20
132	Ground Beef	46200	0.00375	22	669.90	13	487.50	14	539.00	19	644.10	28	982.80	36	1197.00	4520.30
133	Chicken	54600	0.00368	22	669.90	13	487.50	14	539.00	19	644.10	28	982.80	37	1230.25	4553.55
134	Bacon	23625	0.00363	22	669.90	13	487.50	15	577.50	19	644.10	28	982.80	37	1230.25	4592.05
135	Oven Roast	42000	0.00354	23	700.35	13	487.50	15	577.50	19	644.10	28	982.80	37	1230.25	4622.50
136	Ground Beef	47850	0.00352	23	700.35	13	487.50	15	577.50	19	644.10	29	1017.90	37	1230.25	4657.60
137	Chicken	56000	0.00350	23	700.35	13	487.50	15	577.50	19	644.10	29	1017.90	38	1263.50	4690.85
138	Frankfurters	24000	0.00342	23	700.35	13	487.50	15	577.50	20	678.00	29	1017.90	38	1263.50	4724.75
139	Chicken	57400	0.00334	23	700.35	13	487.50	15	577.50	20	678.00	29	1017.90	39	1296.75	4758.00
140	Ground Beef	49500	0.00330	23	700.35	13	487.50	15	577.50	20	678.00	30	1053.00	39	1296.75	4793.10
141	Bacon	25200	0.00329	23	700.35	13	487.50	16	616.00	20	678.00	30	1053.00	39	1296.75	4831.60
142	Pork chops	21000	0.00321	23	700.35	14	525.00	16	616.00	20	678.00	30	1053.00	39	1296.75	4869.10
143	Chicken	58800	0.00318	23	700.35	14	525.00	16	616.00	20	678.00	30	1053.00	40	1330.00	4902.35
144	Oven Roast	43750	0.00313	24	730.80	14	525.00	16	616.00	20	678.00	30	1053.00	40	1330.00	4932.80

Pri	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
145	Ground Beef	51150	0.00311	24	730.80	14	525.00	16	616.00	20	678.00	31	1088.10	40	1330.00	4967.90
146	Chicken	60200	0.00303	24	730.80	14	525.00	16	616.00	20	678.00	31	1088.10	41	1363.25	5001.15
147	Frankfurters	25200	0.00302	24	730.80	14	525.00	16	616.00	21	711.90	31	1088.10	41	1363.25	5035.05
148	Bacon	26775	0.00299	24	730.80	14	525.00	17	654.50	21	711.90	31	1088.10	41	1363.25	5073.55
149	Ground Beef	52800	0.00292	24	730.80	14	525.00	17	654.50	21	711.90	32	1123.20	41	1363.25	5108.65
150	Chicken	61600	0.00289	24	730.80	14	525.00	17	654.50	21	711.90	32	1123.20	42	1396.50	5141.90
151	Oven Roast	45500	0.00277	25	761.25	14	525.00	17	654.50	21	711.90	32	1123.20	42	1396.50	5172.35
152	Chicken	63000	0.00276	25	761.25	14	525.00	17	654.50	21	711.90	32	1123.20	43	1429.75	5205.60
153	Ground Beef	54450	0.00276	25	761.25	14	525.00	17	654.50	21	711.90	33	1158.30	43	1429.75	5240.70
154	Bacon	28350	0.00273	25	761.25	14	525.00	18	693.00	21	711.90	33	1158.30	43	1429.75	5279.20
155	Pork chops	22500	0.00272	25	761.25	15	562.50	18	693.00	21	711.90	33	1158.30	43	1429.75	5316.70
156	Frankfurters	26400	0.00267	25	761.25	15	562.50	18	693.00	22	745.80	33	1158.30	43	1429.75	5350.60
157	Chicken	64400	0.00263	25	761.25	15	562.50	18	693.00	22	745.80	33	1158.30	44	1463.00	5383.85
158	Ground Beef	56100	0.00260	25	761.25	15	562.50	18	693.00	22	745.80	34	1193.40	44	1463.00	5418.95
159	Chicken	65800	0.00252	25	761.25	15	562.50	18	693.00	22	745.80	34	1193.40	45	1496.25	5452.20
160	Bacon	29925	0.00250	25	761.25	15	562.50	19	731.50	22	745.80	34	1193.40	45	1496.25	5490.70
161	Ground Beef	57750	0.00245	25	761.25	15	562.50	19	731.50	22	745.80	35	1228.50	45	1496.25	5525.80
162	Oven Roast	47250	0.00245	26	791.70	15	562.50	19	731.50	22	745.80	35	1228.50	45	1496.25	5556.25
163	Chicken	67200	0.00240	26	791.70	15	562.50	19	731.50	22	745.80	35	1228.50	46	1529.50	5589.50
164	Frankfurters	27600	0.00236	26	791.70	15	562.50	19	731.50	23	779.70	35	1228.50	46	1529.50	5623.40
165	Ground Beef	59400	0.00232	26	791.70	15	562.50	19	731.50	23	779.70	36	1263.60	46	1529.50	5658.50
166	Pork chops	24000	0.00232	26	791.70	16	600.00	19	731.50	23	779.70	36	1263.60	46	1529.50	5696.00
167	Chicken	68600	0.00230	26	791.70	16	600.00	19	731.50	23	779.70	36	1263.60	47	1562.75	5729.25
168	Bacon	31500	0.00230	26	791.70	16	600.00	20	770.00	23	779.70	36	1263.60	47	1562.75	5767.75
169	Chicken	70000	0.00220	26	791.70	16	600.00	20	770.00	23	779.70	36	1263.60	48	1596.00	5801.00
170	Ground Beef	61050	0.00219	26	791.70	16	600.00	20	770.00	23	779.70	37	1298.70	48	1596.00	5836.10
171	Oven Roast	49000	0.00217	27	822.15	16	600.00	20	770.00	23	779.70	37	1298.70	48	1596.00	5866.55
172	Bacon	33075	0.00212	27	822.15	16	600.00	21	808.50	23	779.70	37	1298.70	48	1596.00	5905.05
173	Chicken	71400	0.00210	27	822.15	16	600.00	21	808.50	23	779.70	37	1298.70	49	1629.25	5938.30
174	Frankfurters	28800	0.00209	27	822.15	16	600.00	21	808.50	24	813.60	37	1298.70	49	1629.25	5972.20
175	Ground Beef	62700	0.00208	27	822.15	16	600.00	21	808.50	24	813.60	38	1333.80	49	1629.25	6007.30
176	Chicken	72800	0.00201	27	822.15	16	600.00	21	808.50	24	813.60	38	1333.80	50	1662.50	6040.55
177	Pork chops	25500	0.00198	27	822.15	17	637.50	21	808.50	24	813.60	38	1333.80	50	1662.50	6078.05
178	Ground Beef	64350	0.00197	27	822.15	17	637.50	21	808.50	24	813.60	39	1368.90	50	1662.50	6113.15
179	Bacon	34650	0.00196	27	822.15	17	637.50	22	847.00	24	813.60	39	1368.90	50	1662.50	6151.65
180	Chicken	74200	0.00192	27	822.15	17	637.50	22	847.00	24	813.60	39	1368.90	51	1695.75	6184.90
181	Oven Roast	50750	0.00192	28	852.60	17	637.50	22	847.00	24	813.60	39	1368.90	51	1695.75	6215.35

Pri	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
182	Ground Beef	66000	0.00186	28	852.60	17	637.50	22	847.00	24	813.60	40	1404.00	51	1695.75	6250.45
183	Frankfurters	30000	0.00185	28	852.60	17	637.50	22	847.00	25	847.50	40	1404.00	51	1695.75	6284.35
184	Chicken	75600	0.00184	28	852.60	17	637.50	22	847.00	25	847.50	40	1404.00	52	1729.00	6317.60
185	Bacon	36225	0.00181	28	852.60	17	637.50	23	885.50	25	847.50	40	1404.00	52	1729.00	6356.10
186	Ground Beef	67650	0.00177	28	852.60	17	637.50	23	885.50	25	847.50	41	1439.10	52	1729.00	6391.20
187	Chicken	77000	0.00176	28	852.60	17	637.50	23	885.50	25	847.50	41	1439.10	53	1762.25	6424.45
188	Oven Roast	52500	0.00170	29	883.05	17	637.50	23	885.50	25	847.50	41	1439.10	53	1762.25	6454.90
189	Pork chops	27000	0.00169	29	883.05	18	675.00	23	885.50	25	847.50	41	1439.10	53	1762.25	6492.40
190	Chicken	78400	0.00169	29	883.05	18	675.00	23	885.50	25	847.50	41	1439.10	54	1795.50	6525.65
191	Bacon	37800	0.00168	29	883.05	18	675.00	24	924.00	25	847.50	41	1439.10	54	1795.50	6564.15
192	Ground Beef	69300	0.00168	29	883.05	18	675.00	24	924.00	25	847.50	42	1474.20	54	1795.50	6599.25
193	Frankfurters	31200	0.00165	29	883.05	18	675.00	24	924.00	26	881.40	42	1474.20	54	1795.50	6633.15
194	Chicken	79800	0.00162	29	883.05	18	675.00	24	924.00	26	881.40	42	1474.20	55	1828.75	6666.40
195	Ground Beef	70950	0.00159	29	883.05	18	675.00	24	924.00	26	881.40	43	1509.30	55	1828.75	6701.50
196	Bacon	39375	0.00157	29	883.05	18	675.00	25	962.50	26	881.40	43	1509.30	55	1828.75	6740.00
197	Chicken	81200	0.00155	29	883.05	18	675.00	25	962.50	26	881.40	43	1509.30	56	1862.00	6773.25
198	Ground Beef	72600	0.00151	29	883.05	18	675.00	25	962.50	26	881.40	44	1544.40	56	1862.00	6808.35
199	Oven Roast	54250	0.00150	30	913.50	18	675.00	25	962.50	26	881.40	44	1544.40	56	1862.00	6838.80
200	Chicken	82600	0.00149	30	913.50	18	675.00	25	962.50	26	881.40	44	1544.40	57	1895.25	6872.05
201	Bacon	40950	0.00146	30	913.50	18	675.00	26	1001.00	26	881.40	44	1544.40	57	1895.25	6910.55
202	Frankfurters	32400	0.00146	30	913.50	18	675.00	26	1001.00	27	915.30	44	1544.40	57	1895.25	6944.45
203	Pork chops	28500	0.00145	30	913.50	19	712.50	26	1001.00	27	915.30	44	1544.40	57	1895.25	6981.95
204	Ground Beef	74250	0.00144	30	913.50	19	712.50	26	1001.00	27	915.30	45	1579.50	57	1895.25	7017.05
205	Chicken	84000	0.00143	30	913.50	19	712.50	26	1001.00	27	915.30	45	1579.50	58	1928.50	7050.30
206	Chicken	85400	0.00137	30	913.50	19	712.50	26	1001.00	27	915.30	45	1579.50	59	1961.75	7083.55
207	Ground Beef	75900	0.00137	30	913.50	19	712.50	26	1001.00	27	915.30	46	1614.60	59	1961.75	7118.65
208	Bacon	42525	0.00137	30	913.50	19	712.50	27	1039.50	27	915.30	46	1614.60	59	1961.75	7157.15
209	Oven Roast	56000	0.00132	31	943.95	19	712.50	27	1039.50	27	915.30	46	1614.60	59	1961.75	7187.60
210	Chicken	86800	0.00131	31	943.95	19	712.50	27	1039.50	27	915.30	46	1614.60	60	1995.00	7220.85
211	Ground Beef	77550	0.00130	31	943.95	19	712.50	27	1039.50	27	915.30	47	1649.70	60	1995.00	7255.95
212	Frankfurters	33600	0.00130	31	943.95	19	712.50	27	1039.50	28	949.20	47	1649.70	60	1995.00	7289.85
213	Bacon	44100	0.00128	31	943.95	19	712.50	28	1078.00	28	949.20	47	1649.70	60	1995.00	7328.35
214	Chicken	88200	0.00126	31	943.95	19	712.50	28	1078.00	28	949.20	47	1649.70	61	2028.25	7361.60
215	Pork chops	30000	0.00125	31	943.95	20	750.00	28	1078.00	28	949.20	47	1649.70	61	2028.25	7399.10
216	Ground Beef	79200	0.00124	31	943.95	20	750.00	28	1078.00	28	949.20	48	1684.80	61	2028.25	7434.20
217	Chicken	89600	0.00121	31	943.95	20	750.00	28	1078.00	28	949.20	48	1684.80	62	2061.50	7467.45
218	Bacon	45675	0.00120	31	943.95	20	750.00	29	1116.50	28	949.20	48	1684.80	62	2061.50	7505.95

Pri	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
219	Ground Beef	80850	0.00118	31	943.95	20	750.00	29	1116.50	28	949.20	49	1719.90	62	2061.50	7541.05
220	Oven Roast	57750	0.00117	32	974.40	20	750.00	29	1116.50	28	949.20	49	1719.90	62	2061.50	7571.50
221	Chicken	91000	0.00116	32	974.40	20	750.00	29	1116.50	28	949.20	49	1719.90	63	2094.75	7604.75
222	Frankfurters	34800	0.00115	32	974.40	20	750.00	29	1116.50	29	983.10	49	1719.90	63	2094.75	7638.65
223	Bacon	47250	0.00113	32	974.40	20	750.00	30	1155.00	29	983.10	49	1719.90	63	2094.75	7677.15
224	Ground Beef	82500	0.00112	32	974.40	20	750.00	30	1155.00	29	983.10	50	1755.00	63	2094.75	7712.25
225	Chicken	92400	0.00111	32	974.40	20	750.00	30	1155.00	29	983.10	50	1755.00	64	2128.00	7745.50
226	Pork chops	31500	0.00108	32	974.40	21	787.50	30	1155.00	29	983.10	50	1755.00	64	2128.00	7783.00
227	Ground Beef	84150	0.00107	32	974.40	21	787.50	30	1155.00	29	983.10	51	1790.10	64	2128.00	7818.10
228	Chicken	93800	0.00107	32	974.40	21	787.50	30	1155.00	29	983.10	51	1790.10	65	2161.25	7851.35
229	Bacon	48825	0.00106	32	974.40	21	787.50	31	1193.50	29	983.10	51	1790.10	65	2161.25	7889.85
230	Oven Roast	59500	0.00103	33	1004.85	21	787.50	31	1193.50	29	983.10	51	1790.10	65	2161.25	7920.30
231	Chicken	95200	0.00103	33	1004.85	21	787.50	31	1193.50	29	983.10	51	1790.10	66	2194.50	7953.55
232	Frankfurters	36000	0.00103	33	1004.85	21	787.50	31	1193.50	30	1017.00	51	1790.10	66	2194.50	7987.45
233	Ground Beef	85800	0.00102	33	1004.85	21	787.50	31	1193.50	30	1017.00	52	1825.20	66	2194.50	8022.55
234	Bacon	50400	0.00100	33	1004.85	21	787.50	32	1232.00	30	1017.00	52	1825.20	66	2194.50	8061.05
235	Chicken	96600	0.00099	33	1004.85	21	787.50	32	1232.00	30	1017.00	52	1825.20	67	2227.75	8094.30
236	Ground Beef	87450	0.00097	33	1004.85	21	787.50	32	1232.00	30	1017.00	53	1860.30	67	2227.75	8129.40
237	Chicken	98000	0.00095	33	1004.85	21	787.50	32	1232.00	30	1017.00	53	1860.30	68	2261.00	8162.65
238	Bacon	51975	0.00094	33	1004.85	21	787.50	33	1270.50	30	1017.00	53	1860.30	68	2261.00	8201.15
239	Pork chops	33000	0.00094	33	1004.85	22	825.00	33	1270.50	30	1017.00	53	1860.30	68	2261.00	8238.65
240	Ground Beef	89100	0.00093	33	1004.85	22	825.00	33	1270.50	30	1017.00	54	1895.40	68	2261.00	8273.75
241	Frankfurters	37200	0.00091	33	1004.85	22	825.00	33	1270.50	31	1050.90	54	1895.40	68	2261.00	8307.65
242	Chicken	99400	0.00091	33	1004.85	22	825.00	33	1270.50	31	1050.90	54	1895.40	69	2294.25	8340.90
243	Oven Roast	61250	0.00091	34	1035.30	22	825.00	33	1270.50	31	1050.90	54	1895.40	69	2294.25	8371.35
244	Bacon	53550	0.00089	34	1035.30	22	825.00	34	1309.00	31	1050.90	54	1895.40	69	2294.25	8409.85
245	Ground Beef	90750	0.00089	34	1035.30	22	825.00	34	1309.00	31	1050.90	55	1930.50	69	2294.25	8444.95
246	Chicken	100800	0.00088	34	1035.30	22	825.00	34	1309.00	31	1050.90	55	1930.50	70	2327.50	8478.20
247	Ground Beef	92400	0.00085	34	1035.30	22	825.00	34	1309.00	31	1050.90	56	1965.60	70	2327.50	8513.30
248	Bacon	55125	0.00084	34	1035.30	22	825.00	35	1347.50	31	1050.90	56	1965.60	70	2327.50	8551.80
249	Chicken	102200	0.00084	34	1035.30	22	825.00	35	1347.50	31	1050.90	56	1965.60	71	2360.75	8585.05
250	Frankfurters	38400	0.00081	34	1035.30	22	825.00	35	1347.50	32	1084.80	56	1965.60	71	2360.75	8618.95
251	Pork chops	34500	0.00081	34	1035.30	23	862.50	35	1347.50	32	1084.80	56	1965.60	71	2360.75	8656.45
252	Ground Beef	94050	0.00081	34	1035.30	23	862.50	35	1347.50	32	1084.80	57	2000.70	71	2360.75	8691.55
253	Chicken	103600	0.00081	34	1035.30	23	862.50	35	1347.50	32	1084.80	57	2000.70	72	2394.00	8724.80
254	Oven Roast	63000	0.00080	35	1065.75	23	862.50	35	1347.50	32	1084.80	57	2000.70	72	2394.00	8755.25

Prt	Item	Eval Stk Level	Eval Ratio	Oven Roast	Space/ Pallet	Pork Chop	Space/ Pallet	Bacon	Space/ Pallet	Frank-furter	Space/ Pallet	Ground Beef	Space/ Pallet	Chicken	Space/ Pallet	Total Space
255	Bacon	56700	0.00080	35	1065.75	23	862.50	36	1386.00	32	1084.80	57	2000.70	72	2394.00	8793.75
256	Chicken	105000	0.00078	35	1065.75	23	862.50	36	1386.00	32	1084.80	57	2000.70	73	2427.25	8827.00
257	Ground Beef	95700	0.00077	35	1065.75	23	862.50	36	1386.00	32	1084.80	58	2035.80	73	2427.25	8862.10
258	Bacon	58275	0.00076	35	1065.75	23	862.50	37	1424.50	32	1084.80	58	2035.80	73	2427.25	8900.60
259	Chicken	106400	0.00075	35	1065.75	23	862.50	37	1424.50	32	1084.80	58	2035.80	74	2460.50	8933.85
260	Ground Beef	97350	0.00074	35	1065.75	23	862.50	37	1424.50	32	1084.80	59	2070.90	74	2460.50	8968.95
261	Frankfurters	39600	0.00072	35	1065.75	23	862.50	37	1424.50	33	1118.70	59	2070.90	74	2460.50	9002.85
262	Chicken	107800	0.00072	35	1065.75	23	862.50	37	1424.50	33	1118.70	59	2070.90	75	2493.75	9036.10
263	Bacon	59850	0.00072	35	1065.75	23	862.50	38	1463.00	33	1118.70	59	2070.90	75	2493.75	9074.60
264	Oven Roast	64750	0.00071	36	1096.20	23	862.50	38	1463.00	33	1118.70	59	2070.90	75	2493.75	9105.05
265	Ground Beef	99000	0.00071	36	1096.20	23	862.50	38	1463.00	33	1118.70	60	2106.00	75	2493.75	9140.15
266	Pork chops	36000	0.00071	36	1096.20	24	900.00	38	1463.00	33	1118.70	60	2106.00	75	2493.75	9177.65
267	Chicken	109200	0.00069	36	1096.20	24	900.00	38	1463.00	33	1118.70	60	2106.00	76	2527.00	9210.90
268	Bacon	61425	0.00068	36	1096.20	24	900.00	39	1501.50	33	1118.70	60	2106.00	76	2527.00	9249.40
269	Ground Beef	100650	0.00068	36	1096.20	24	900.00	39	1501.50	33	1118.70	61	2141.10	76	2527.00	9284.50
270	Chicken	110600	0.00066	36	1096.20	24	900.00	39	1501.50	33	1118.70	61	2141.10	77	2560.25	9317.75
271	Bacon	63000	0.00065	36	1096.20	24	900.00	40	1540.00	33	1118.70	61	2141.10	77	2560.25	9356.25
272	Ground Beef	102300	0.00065	36	1096.20	24	900.00	40	1540.00	33	1118.70	62	2176.20	77	2560.25	
273	Frankfurters	40800	0.00065	36	1096.20	24	900.00	40	1540.00	34	1152.60	62	2176.20	77	2560.25	
274	Chicken	112000	0.00064	36	1096.20	24	900.00	40	1540.00	34	1152.60	62	2176.20	78	2593.50	
275	Oven Roast	66500	0.00062	37	1126.65	24	900.00	40	1540.00	34	1152.60	62	2176.20	78	2593.50	
276	Ground Beef	103950	0.00062	37	1126.65	24	900.00	40	1540.00	34	1152.60	63	2211.30	78	2593.50	
277	Bacon	64575	0.00062	37	1126.65	24	900.00	41	1578.50	34	1152.60	63	2211.30	78	2593.50	
278	Chicken	113400	0.00061	37	1126.65	24	900.00	41	1578.50	34	1152.60	63	2211.30	79	2626.75	
279	Pork chops	37500	0.00061	37	1126.65	25	937.50	41	1578.50	34	1152.60	63	2211.30	79	2626.75	
280	Ground Beef	105600	0.00059	37	1126.65	25	937.50	41	1578.50	34	1152.60	64	2246.40	79	2626.75	
281	Chicken	114800	0.00059	37	1126.65	25	937.50	41	1578.50	34	1152.60	64	2246.40	80	2660.00	
282	Bacon	66150	0.00059	37	1126.65	25	937.50	42	1617.00	34	1152.60	64	2246.40	80	2660.00	
283	Frankfurters	42000	0.00058	37	1126.65	25	937.50	42	1617.00	35	1186.50	64	2246.40	80	2660.00	
284	Chicken	116200	0.00057	37	1126.65	25	937.50	42	1617.00	35	1186.50	64	2246.40	81	2693.25	
285	Ground Beef	107250	0.00057	37	1126.65	25	937.50	42	1617.00	35	1186.50	65	2281.50	81	2693.25	
286	Bacon	67725	0.00056	37	1126.65	25	937.50	43	1655.50	35	1186.50	65	2281.50	81	2693.25	
287	Oven Roast	68250	0.00055	38	1157.10	25	937.50	43	1655.50	35	1186.50	65	2281.50	81	2693.25	
288	Chicken	117600	0.00055	38	1157.10	25	937.50	43	1655.50	35	1186.50	65	2281.50	82	2726.50	
289	Ground Beef	108900	0.00054	38	1157.10	25	937.50	43	1655.50	35	1186.50	66	2316.60	82	2726.50	
290	Pork chops	39000	0.00054	38	1157.10	26	975.00	43	1655.50	35	1186.50	66	2316.60	82	2726.50	

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